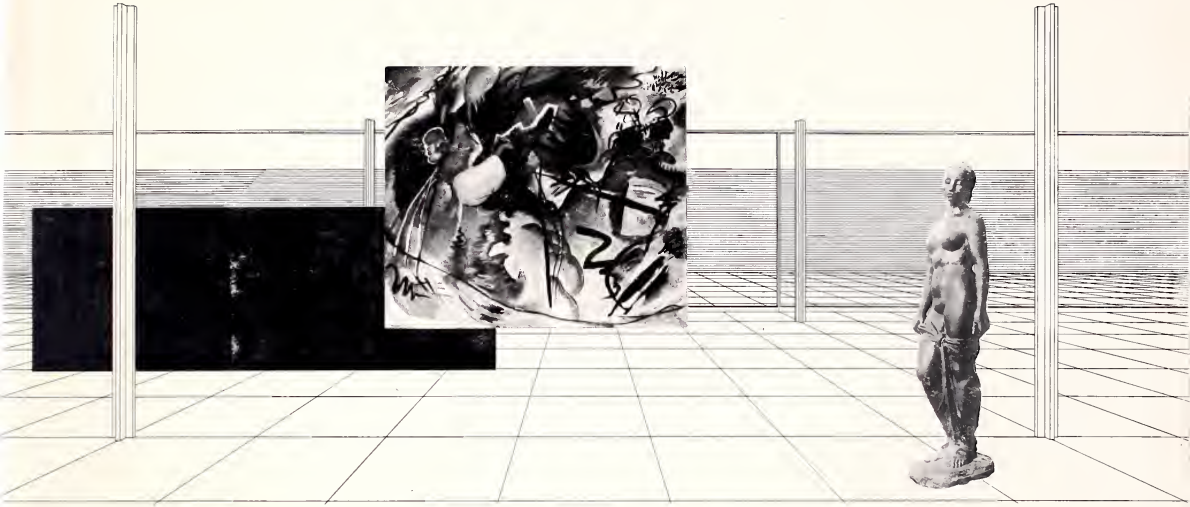

ARCHITECTURAL EDUCATION AT IIT 1938-1978

ALFRED SWENSON PAO-CHI CHANG

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ILLINOIS INSTITUTE OF TECHNOLOGY

This publication is supported by grants from the National Endowment for the Arts, the Graham Foundation for Advanced Studies in the Fine Arts, and the Illinois Arts Council, a state agency.

Published by Illinois Institute of Technology, Chicago, Illinois

LC Number: 79-89021

Layout and typography by Pao-Chi Chang and Alfred Swenson

Printed in U.S.A. by Printing Arts, Inc., Chicago, Illinois

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FOREWORD

Professor George Edson Danforth

In the mid-1930's in America, architectural education was at a low ebb. The influence of the Ecole des Beaux-Arts had waned and architecture generally was wandering about in an atmosphere of historical revivalism. The lessons of Chicago School architects such as William Le Baron Jenney, John Root and Louis Sullivan were all but ignored. In both practice and education, architecture denied having any relationship to or logical outgrowth of the spirit of the Industrial Age.

How fortuitous were the circumstances which brought Mies van der Rohe to Chicago in 1938, for in his work and projects up to that time, and certainly in those which were to follow, there was embodied the essence of the Chicago School of Architecture which had lain dormant for so many years.

It was a deeply felt experience to have been at Armour Institute of Technology at the time Mies and his colleagues, Ludwig Hilberseimer and Walter Peterhans were developing the program of study which was to make a profound impact on architecture. Fortunately there was a small number of students in the school in those early years before World War II which enabled these men to evolve the program slowly, allowing many things to be tried. Wisely Mies let those students with advanced standing complete the curriculum under which they began their studies if they so chose, concentrating his attention on those who would be going through the new curriculum. Thus did he have time to clarify in his mind the principles underlying the philosophy on which the curriculum was developed.

Mies firmly believed, and often reiterated in his lectures and writings, that an architectural curriculum is a means of training and education, not an end in itself but dependent upon and serving a philosophy.

The essence of architectural education, he felt, was to develop a method of work, a way of doing, a striving towards clarity of thought, a concentration on fundamentals.

This order of work is evident in the examples of student work and complementary text contained in this publication developed by two members of the IIT faculty, Professors Pao-Chi Chang and Alfred Swenson, and presents for the first time an important documentation of a program which is a major force in twentieth century architectural education.

PREFACE

Ludwig Mies van der Rohe came to Chicago in 1938 as Director of the Department of Architecture at Armour Institute of Technology. There he developed a new undergraduate curriculum, which has been the basis of architectural education at Illinois Institute of Technology since its founding in 1940 through the merger of the Armour and Lewis Institutes. Mies viewed architecture as embodying many levels of value, extending from the entirely functional to the realm of pure art. He also believed, through his interpretation of history, that the aim of architecture is to truly represent its epoch, and that the architect must search out and express the truth of the time. Therefore the curriculum is structured to lead the student by a rational method, from the simpler to the more profound aspects of architecture. It also seeks to help the students understand the significant facts and ideas of our age, and how they may be translated through clear construction to make an architecture worthy of its greatness.

This book will document the IIT architecture curriculum in detail for the first time. It begins with a brief historical account of the IIT Department of Architecture and its predecessors. The philosophy of the curriculum is then discussed in relation to the basic documents that guided its development. Next the seven course sequences of the undergraduate curriculum are described, with related documents and examples of student work. Finally the work of the graduate school is considered, illustrated by a group of thesis projects. It was our intention to present the curriculum in a clear, simple manner, and to have the material speak for itself as much as possible.

We wish to express our gratitude to the organizations whose grants made this publication possible, and to their officers who were most helpful to us. They include the National Endowment for the Arts and the successive Directors of its Architecture Program, Bill N. Lacy and Roy F. Knight; the Graham Foundation for Advanced Studies in the Fine Arts and its Executive Director, Carter H. Manny, Jr.; and the Illinois Arts Council, a state agency. We must also thank the Illinois Institute of Technology for the opportunity to teach there, and for its permission to publish student work. It is intended that the proceeds of this book will go towards the funding of a continuing serial publication to be called the *IIT Architectural Review.*

We must give our particular thanks to Professors George E. Danforth and Myron Goldsmith who worked with us throughout as an advisory committee. Both of them have been connected with the IIT Department of Architecture over the whole period covered, and their knowledge and insight have been invaluable to us.

We must also thank a number of people who helped us in various ways, especially Dean Geoffrey Higgins and George Overton, as well as Richard Bennett, Professor Daniel Brenner, Professor Carl Condit, John Entenza, Dean James Ingo Freed, Dean Sidney Guralnick, Dean Jong-Soung Kimm, Fazlur Khan, Jerrold Loebl, William Priestley, Professor David Sharpe, Professor Paul Thomas, John Vinci and our colleagues in the Departments of Architecture and of City and Regional Planning. Finally we must express our thanks to Professor Ludwig Mies van der Rohe for teaching us the significance of architecture and imparting to us his enthusiasm for it.

Alfred Swenson   Pao-Chi Chang

THE IIT DEPARTMENT OF ARCHITECTURE AND ITS PREDECESSORS: 1889-1978

A community of professional architects began to appear in Chicago after the Great Fire of 1871. The destruction caused by the fire, together with the continued expansion of the city, created a demand not only for new buildings, but ones of growing size and complexity. Among the architects attracted to Chicago by the post-fire building boom were such men as William Jenney, Daniel Burnham, John Root, William Holabird, Martin Roche, Dankmar Adler and Louis Sullivan. By the 1880's, this group of architects had begun to create the magnificent constellation of early skyscrapers that would become known to the world as the work of the Chicago School. It seems only natural that such a group would also be interested in education. In fact, Jenney had made an unsuccessful effort to start a school of architecture at the University of Michigan in 1876.(1) Although the University of Illinois had offered a course in architecture since 1873, it was 100 miles away in Urbana.(2) The Chicago architects wanted a school nearby to train new people for their growing profession, and in which they could also participate in the educational process.

The IIT Department of Architecture had its origin in a short two-year course in architecture organized at the Art Institute of Chicago in 1889. The program was headed by Louis J. Millet, an architect who had studied at the Ecole des Beaux-Arts and the Ecole des Arts Decoratif in Paris. Several other well-known Chicago architects including Burnham, Root, Jenney and Irving Pond became interested in the program, giving lectures and criticism in the design classes.(3)

Shortly after, in 1892, the Armour Institute of Technology was founded by the Armour family, which had made its fortune in the great Chicago meat-packing industry. Armour Institute's first president, Dr. Frank W. Gunsaulus, took the Massachusetts Institute of Technology and the Technische Hochschule at Charlottenburg-Berlin as his models. Both of these schools had departments of architecture in addition to their strong emphasis on engineering education, and Armour followed their example. The first Armour architecture students were admitted in 1893.(4)

The patron-architects of the Art Institute courses soon saw the engineering studies at Armour as a desirable ingredient in their program, and in 1895 the two architecture schools were merged together. The Art Institute and Armour Institute made an agreement to jointly operate an architecture program, which was called the Chicago School of Architecture. Armour provided science, engineering and general education courses, while the drawing and design courses remained at the Art Institute. The students received a Bachelor of Science degree in Architecture from Armour after four years. Louis J. Millet was appointed the first director of the school.(5)

Daniel Burnham emerged as a leading patron of the school, and continued in this role until his death in 1912.(6) Burnham was of course a major promoter of Beaux-Arts eclecticism in American architecture. This influence was displayed in the buildings done under his leadership at the World's Columbian Exposition, which opened in Chicago in 1893. The success of Burnham's "White City" soon eclipsed the earlier work of the Chicago School. The classical canons of the Beaux-Arts would dominate American architecture and its schools for the next 35 years.

The Armour curriculum could never completely imitate the Beaux-Arts system, with its ateliers headed by practicing professionals. Also the engineering component of the program remained important, reflecting

a strong vein of pragmatism in the Chicago architectural world. But the school did belong to the Beaux-Arts Institute of Design, giving the problems set by the Institute to the Armour students, and sending their work to New York to be judged. Local architects continued to give lectures and criticism in the design classes, and serve on juries for some problems.

Millet retired as Director in 1902, and was followed by Walter Shattuck, who had studied at the University of Illinois. Charles H. Hammond served as Instructor in Elements of Design from 1906 to 1910. Andrew Rebori came as Professor of Design in 1910 and was succeeded in 1913 by Edmund Campbell, a graduate of MIT who had previously taught at Carnegie Institute. Campbell became director of the department in 1914 following Shattuck's resignation, and remained until 1925 when he went to New York to become Dean of the Beaux-Arts Institute of Design. Earl H. Reed, who had been appointed Instructor in Design in 1915, replaced Campbell as director; it was during his tenure that a Master of Science program in architecture was introduced in 1932.(7)

By the middle of the 1920's a new generation of Chicago architects had emerged, and with it departures from Beaux-Arts classicism began to appear. The new firm of Holabird and Root produced such fine examples of Art Deco design as the Palmolive Building, 333 North Michigan Avenue and the Daily News Building. Graham, Anderson, Probst and White built the Civic Opera, Merchandise Mart and the Field Building in a similar style. Monroe and Irving Bowman, themselves recent graduates of Armour Institute, made more radical designs for towers with curtain walls composed of horizontal bands of glass and metal. Buckminister Fuller developed his Dymaxion House project in Chicago, exhibiting it at the Marshall Field Store in 1929. The second great world's fair held in Chicago, the Century of Progress Exposition which opened in 1933, made a marked contrast with Burnham's fair of 40 years before. Most of the buildings were done in Art Deco, with a few examples of the International Style which had begun to radiate its influence from Europe. The long dominance of the Beaux-Arts in Chicago architecture had begun to wane.

In 1935 Earl Reed announced his intention to resign as Director of the Armour Architecture Department. Henry T. Heald, then Dean of the College of Engineering at Armour, asked John A. Holabird, a distinguished Chicago architect, to head a search committee for a new director. Holabird, the son of Chicago School pioneer William Holabird, had studied at the Ecole des Beaux-Arts and had led the introduction of the Art Deco skyscraper to Chicago a decade earlier. The other members of the committee were also Chicago architects; Alfred Alschuler, Charles Hammond, Jerrold Loebl and Alfred Shaw. Louis Skidmore and Loebl served successively as acting directors of the department after Reed's departure in 1936.(8)

Oddly enough, it was David Adler who first suggested Ludwig Mies van der Rohe as a candidate for Director of the Armour Architecture Department to Holabird and Loebl during a casual meeting in front of the Chicago Art Institute in the summer of 1936.(9) Adler was a well-known Chicago architect who specialized in houses for wealthy clients in a wide variety of eclectic styles. Neither Holabird or Loebl had ever heard of Mies before; Adler took them at once to the Burnham Library of the Art Institute where he showed them pictures of the Barcelona Pavilion and the Tugendhat House. Holabird was impressed by the pictures of Mies' work, and was interested to learn that he was an educator as well, having been the Director of the Bauhaus during its last difficult years in Dessau and Berlin. Holabird wrote to Mies, inviting him to come to Chicago to discuss the Armour Directorship, but received no reply.(10)

Some time later, in the summer of 1937, Mies visited the United States to design a house for Stanley Resor at Jackson Hole, Wyoming. On his return from visiting the site, Mies planned to stop in Chicago to visit William Priestley, who had been one of his few American students in architecture at the Bauhaus. Priestley was then building a house near Chicago, with Holabird and Root as his associated engineers. When Holabird heard of Mies' impending visit, he asked Priestley to arrange a meeting with Mies to discuss the

A

B

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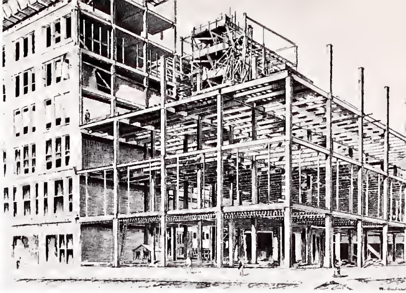

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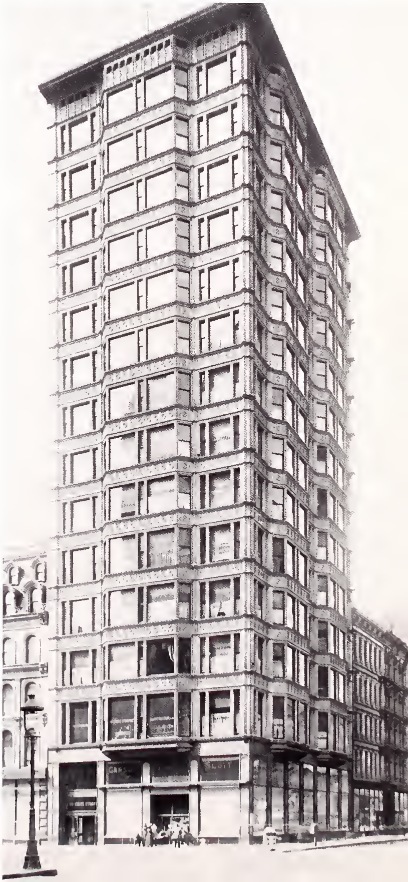
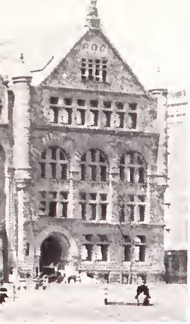


William LeBaron Jenney (1832-1907) **A**, Daniel Hudson Burnham (1846-1912) **B**, and John Wellborn Root (1850-1891) **C**, were three of the founding patrons of the Architecture Program begun at the Art Institute of Chicago in 1889, which merged with the Department of Architecture of Armour Institute of Technology in 1895. All three were leading pioneers of the Chicago School. Jenney developed the steel frame, exemplified by his Fair Store **D**, of 1891. Burnham and Root built the slender Reliance Building **E**, with a height of over 200 ft. during 1890-1895. After Root's death, Burnham became a leading proponent of Beaux-Arts eclecticism, as illustrated by the Civic Center **F**, proposed in his Plan for Chicago of 1909.

F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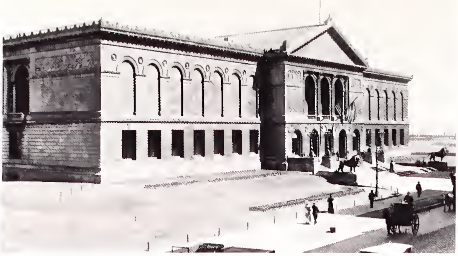
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C

The Art Institute of Chicago II (Burnham & Root, 1887; sold to Chicago Club, 1893; demolished 1929) **A**, was the site of the first architecture classes in 1889. The Art Institute of Chicago III (Shepley, Rutan & Coolidge, 1893) **B**, and the Main Building of Armour Institute of Technology (Patten & Fisher, 1893) **C**, were the locations of studio and academic classes respectively after the merger of 1895. When the IIT Department of Architecture studio classes left the Art Institute in 1945, they were briefly housed in the Gage Building (Holabird & Roche, facade by Louis Sullivan, 1899) **D**. In 1947 the department moved to Alumni Hall at the IIT Campus (Ludwig Mies van der Rohe, Holabird and Root associated, 1946) **E**.

D

E


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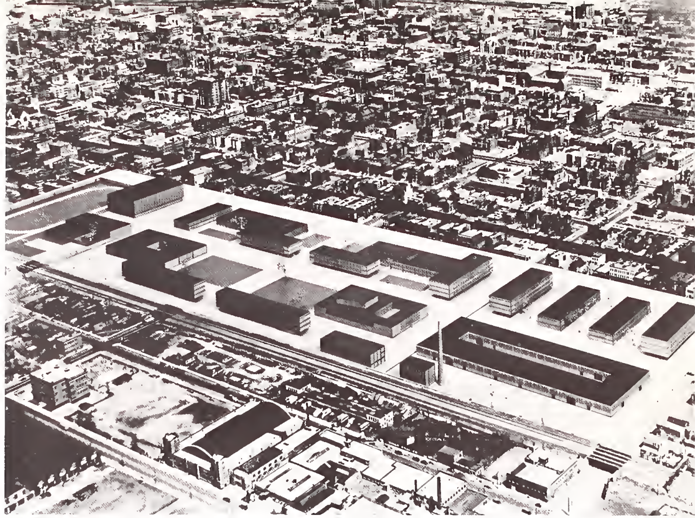
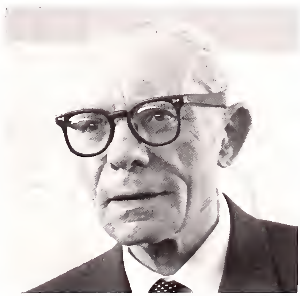
G



David Adler (1883-1949) **A**, was a Chicago architect who first suggested Ludwig Mies van der Rohe as a candidate for Director of the Department of Architecture at Armour in 1936. He made his suggestion to John A. Holabird (1886-1945) **B**, who had been appointed chairman of a search committee for a new director by Henry T. Heald (1904-1975) **C**, then President of Armour.


D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F

Ludwig Mies van der Rohe (1886-1969) **D**, was appointed Director of the Department of Architecture at Armour by Heald in 1938. Mies brought with him to Armour two of his former colleagues at the Bauhaus, Ludwig K. Hilberseimer (1885-1967) **E**, and Walter A. Peterhans (1897-1960) **F**. After Heald became President of IIT in 1940, he commissioned Mies to design a new campus for the Institute **G**

A

In 1955 the IIT Department of Architecture moved into the newly completed S. R. Crown Hall (Ludwig Mies van der Rohe; Pace Associates associated, Charles Genther, partner in charge; 1955) **A**. The architecture studio classes are held on the upper level, which is one large space 120 ft. by 220 ft. **B**

B

Armour Directorship. After Mies arrived in Chicago he met several times with Holabird, Henry Heald, who was now president of Armour Institute, and James Cunningham, the Chairman of the Armour Board of Trustees. Priestley and the architect Bertrand Goldberg (who had also studied briefly at the Bauhaus) acted as interpreters for Mies, who knew little English. At the final meeting, an offer was made to Mies to become the Director of The Armour Department of Architecture. He did not accept it at once, saying that he would like to change the curriculum, and would need some time to prepare his new program and present it to Heald and Cunningham. If they approved it, he would be willing to come to Armour.(11)

After paying a visit to Frank Lloyd Wright at Taliesin, Mies returned to New York, where he developed his design for the Resor House with the assistance of Priestley and John Rodgers, another of his former Bauhaus students. At the same time, Priestley and Rodgers helped Mies to make a chart that would present his ideas for the new Armour curriculum. In New York by chance Mies met Walter Peterhans, a former colleague at the Bauhaus who had taught photography there. Peterhans was fluent in English, and he helped Mies translate his thoughts for the curriculum. The completed chart, entitled A Program for Architectural Education, was mailed to Chicago in the Fall of 1937. Heald and Cunningham approved it without revision, and Mies accepted the position of director.(12) It was also agreed that Peterhans, Rodgers and Ludwig Hilberseimer, a German architect who had headed the City Planning Department at the Bauhaus, would also be appointed to the Armour architecture faculty.

Shortly after he arrived in Chicago in the Fall of 1938, Mies delivered an Inaugural Address, in which he further clarified his thoughts for the curriculum. He concluded it with these moving words: "Nothing can express the aim and meaning of our work better than the profound words of St. Augustine: 'Beauty is the splendor of Truth'."(13)

Starting from the ideas expressed in the chart and the Inaugural Address, Mies and his colleagues developed the new curriculum over the next few years. It evolved as a series of overlapping courses that would show the student "what is possible in construction, what is necessary for use, and what is significant as art." It was also decided to end the four year Bachelor of Science course in architecture which had been in effect since 1895, and offer a five-year program leading to a Bachelor of Architecture Degree. The Master of Science graduate program in architecture was continued unchanged. The five-year curriculum was first described in the narrative statement and course outline published in the Armour catalog in 1941.(14) However, due to the drop in enrollment caused by World War II, the five year program was not finally inaugurated until 1947. In that year the program was also accredited by the National Architectural Accrediting Board.

The new curriculum was not the only contribution Mies made to the school. In 1940, Armour merged with the Lewis Institute to form the Illinois Institute of Technology, under the presidency of Henry Heald. It was decided to combine the facilities of the two schools on a new campus to be built around the existing Armour buildings, and Mies, again with the support of John Holabird, was commissioned to design it. Mies continued to work on the campus for nearly 20 years, producing a group of world-renowned buildings, which still form the core of the IIT community.

In 1946, the architecture studio classes left the Art Institute for a temporary home in the Gage Building before moving to Mies' newly-completed Alumni Memorial Hall on the IIT campus in 1947. In 1955 the department again moved, this time to Crown Hall, which was planned by Mies as the permanent home of the architecture classes, and is perhaps the most significant of his buildings in the IIT campus group. A gift of the Crown family in memory of S. R. Crown, it houses the Departments of Architecture and of City and Regional Planning, and the Institute of Design which teaches photography and product and graphic design. The upper level is a single large room, defined by glass walls and a roof plane suspended from exposed steel plate girders. In this open flexible space most of the architecture classes are held,

each able to see the work of the other, and thus to clearly comprehend the processes of the curriculum.

In 1955 a separate Department of City and Regional Planning was created under Professor Hilberseimer. He remained its chairman until his death in 1967, when he was succeeded by Professor Paul Thomas. The department has remained closely related to architecture, teaching the planning sequence courses of the curriculum, while also offering undergraduate and graduate degree programs.

Mies retired from teaching in 1958, having reached the mandatory retirement age; Professor Reginald Malcolmson became acting director. The new director chosen to head the department in 1959 was George E. Danforth. He had been one of Mies' first students at Armour, and had joined the department
1941 faculty in 1946. In 1953 he was appointed the Chairman of the Department of Architecture at Western Reserve University in Cleveland, Ohio, where he introduced a new curriculum modelled on that of IIT.

A School of Architecture and Planning was formed in 1965, including the Departments of Architecture and City and Regional Planning, with Professor Danforth serving as Director, while also continuing as chairman of the department. Under his leadership the department enrollment grew from about 125 students in 1959 to nearly 400 in 1975, when he resigned as chairman of the department and director of the school to return to teaching.

In 1975 the new president of IIT, Dr. Thomas L. Martin Jr., established a separate College of Architecture, Planning and Design, comprised of the Departments of Architecture, City and Regional Planning, and the Institute of Design. James Ingo Freed, a partner in the New York architectural firm of I. M. Pei and Partners and a graduate of IIT, was appointed Dean of the College and Professor of Architecture in 1975, resigning in 1977. Professor David Sharpe was appointed acting chairman of the department in 1976.

For nearly 90 years the IIT Department of Architecture and its predecessors have been part of the Chicago architectural world. During this period, Chicago has been a well-spring of major architectural ideas and achievements; in recent years its architectural tradition has radiated its influence throughout the nation and beyond. The IIT curriculum of the past 40 years has made an important contribution to the mainstream of this tradition. At the dedication of Crown Hall in 1956, Mies said:

> Let this building be the home of ideas and adventures. Real ideas, ideas based on reason, ideas about facts. Then the building will be of great service to our students and in the end a real contribution to our civilization. We know that it will not be easy, noble things are never easy. Experience teaches us that they are as difficult as they are rare.(15)

1. Arthur Clason Weatherhead, *A History of Collegiate Education in Architecture in the United States,* Los Angeles, 1941, p. 43.
2. Ibid, p. 36.
3. Ibid, p. 57.
4. Irene Macauley, *The Heritage of Illinois Institute of Technology,* Chicago, 1978, p. 19-20.
5. Weatherhead, op. cit., p. 58.
6. Ibid, p. 106.
7. Ibid, p. 105-106.
8. Macauley, op. cit., p. 63.
9. Franz Schulze, "How Chicago Got Mies–And Harvard Didn't", *Inland Architect,* May, 1977, p. 23.
10. William Priestley, conversation with the authors, 1978.
11. Ibid.
12. Ibid.
13. See p. 28.
14. See p. 29.
15. Quoted in Peter Carter, "Mies van der Rohe", *Architectural Design* (London), March, 1961, p. 110.

UNDERGRADUATE CURRICULUM

THE IIT CURRICULUM IN ARCHITECTURE

The IIT undergraduate curriculum consists of a carefully structured series of courses, each building upon the material previously developed, leading the student from the simpler to the more profound aspects of architecture. This arrangement is a reflection of Mies' concept of a hierarchical scale of value in architecture, as he pointed out in his Inaugural Address of 1938:

> In its simplest form architecture is rooted in entirely functional considerations, but it can reach up through all degrees of value to the highest sphere of spiritual existence, into the realm of pure art. In organizing an architectural education system we must recognize this situation if we are to succeed in our efforts. We must fit the system to this reality. Any teaching of architecture must explain these relations and interrelations.(1)

The step-by-step approach of the curriculum is combined with the teaching of a rational method of thinking and working. Through this method, it seeks to develop in the student a sense of clarity and objectivity, of discipline and professional responsibility. As Mies put it in the Inaugural Address:

> Education must lead us from irresponsible opinion to true responsible judgement. It must lead us from chance and arbitrariness to rational clarity and intellectual order.
> Therefore let us guide our students over the road of discipline from materials, through function, to creative work.(2)

The definitive version of the five-year curriculum published in 1941 shows how Mies' aims, expressed in the 1937 Program for Architectural Education and the 1938 Inaugural Address, led to a series of seven overlapping sequences of courses that would successively teach the student ". . . what is possible in construction, what is necessary for use, and what is significant as art."(3)

The curriculum begins with the drawing sequence which extends through the first and second years. The students first learn line drawing with instruments, and then apply it to the manipulation of space in two-dimensional form. They also study free-hand drawing from life. Clear drawing is regarded as a fundamental tool of the architect, which must be mastered before attempting anything else.

In the first year the history sequence also starts, which continues through the third year. The great buildings of the past are studied in their cultural context, not as objects for imitation, but rather to evoke in the student's imagination the possibility of creating buildings of equal value with the means our time affords.

The science-engineering sequence too, begins in the first year, providing three years of intensive background for the student in these areas, which contribute directly to the parallel construction and planning sequences.

Also beginning in the first year, and continuing throughout the five years of the curriculum, the architecture students participate in the IIT General Education Program, taking a variety of elective courses in other disciplines to further broaden their perspective beyond the detailed considerations of their field.

The second year marks the start of the two-year visual training sequence. In these courses, the students

extend the line and spatial studies of the drawing sequence to a group of abstract problems which sharpen their visual perception in the making and judging of form, space, texture, color and proportion.

The work done in the drawing and engineering classes prepares the student for the construction sequence in the second and third years. The construction courses introduce the student to such basic materials as brick, wood, steel and concrete, and their use in simple buildings. The possibilities and limitations of these materials are investigated, and the structural systems and architectural expression they imply are explored. In construction, the students encounter the fundamental means for the realization of architecture.

In the third and fourth years the planning sequence applies the students' knowledge of drawing, visual training, engineering and construction to the study of function. Beginning with the study of single-function rooms, the planning studies are extended upward in scale to dwellings, community buildings, settlement units and finally to cities.

The architecture sequence, extending through the fourth and fifth years, forms the synthesis of all the previous work. Drawing, visual training, history, engineering, construction and planning all contribute to the following advanced studies: space as an architectural problem, painting and sculpture in relation to architecture, structure as an architectural factor, and the expressive value of materials, all of which are then applied to specific building projects. Concurrently there is an exploration, in seminars and discussions, of the compelling and supporting forces of our times, and their influence on architecture and the role of the architect. As an option, in the fifth year the students may study regional planning in place of the architecture sequence courses.

As mentioned earlier, the curriculum's hierarchical structure, beginning with the simple and proceeding toward the profound, reflected Mies' view that such a structure is manifested in architecture itself. He spoke of an ascending scale of value, starting with buildings that were "entirely functional" and extending upward to those in the "realm of pure art". The curriculum seeks to present to the student the possibility of making buildings of appropriate character and true value at every level of this scale. But it is in the upper range of this scale, which Mies explored mostly with students at the graduate level, that the ultimate aim of architecture is realized: the achievement of significance as art. He suggested that this significance is related to truth, not only by his concluding quotation from St. Augustine in the Inaugural Address, "Beauty is the splendor of Truth", but also by these later remarks:

> In all these years I have learned more and more that architecture is not a play with forms. I have come to understand the close relationship between architecture and civilization. I have learned that architecture must stem from the sustaining and driving forces of civilization. And that it can be, at its best, an expression of the innermost structure of its time.
>
> The structure of civilization is not simple, being in part the past, in part the present, and in part the future. It is difficult to define and to understand. Nothing of the past can be changed, by its very nature. The present has to be accepted, and should be mastered. But the future is open — open for creative thought and action.
>
> This is the structure from which architecture emerges. It follows, then, that architecture should be related to only the most significant forces in the civilization. Only a relationship which touches the essence of the time can be real. This relation I like to call a truth relation. Truth in the sense of Thomas Aquinas, as the "*Adaequatio rei et intellectus*". Or, as a modern philosopher expressed it in the language of today: "Truth is the significance of facts". Only such a relationship is able to embrace the complex nature of civilization. Only so, will architecture be involved in the evolution

> of civilization. And only so, will it express the slow unfolding of its form.(4)

This definition of truth was also reflected in Mies' interpretation of history. Each epoch has its own set of facts, and its own understanding of their significance. He viewed the great buildings of the past as setting a standard of excellence by their clear expression of the essence of their epoch. Through the clarity and quality of refinement of their elements, they achieved a sense of harmony or *concordantia,* a standard we must strive to meet in our own creative efforts. Mies regarded the meaningful ornament of Greek temples and Gothic cathedrals as refinements that enhanced and enriched their clear construction and clear functional elements. He believed that architecture must honestly use only the medium of its epoch, and never clothe its buildings in the forms of the past, whose true spirit can never relate to any time but their own.

Clearly for Mies, the ideas that shaped the industrial world, and the unique facts of function and construction they informed, expressed the true significance of our time and were the stuff from which our architecture must be made.

Mies was also clearly aware of the problems raised by industrial technology, and that it was not to be used blindly:

> We shall be concerned with genuine problems, problems related to the value and purpose of our technology. We shall show that technology not only promises greatness and power, but also involves dangers; that good and evil apply to it as to all human actions; that it is our task to make the right decision.(5)

However, the means, purposes and ideas of our civilization continue to change, as Mies recognized:

> We are not at the end but the beginning of an epoch. An epoch which will be guided by a new spirit, which will be driven by new forces, new technological, sociological and economic forces. And which will have new tools and new materials. For this reason, we will have a new architecture.(6)

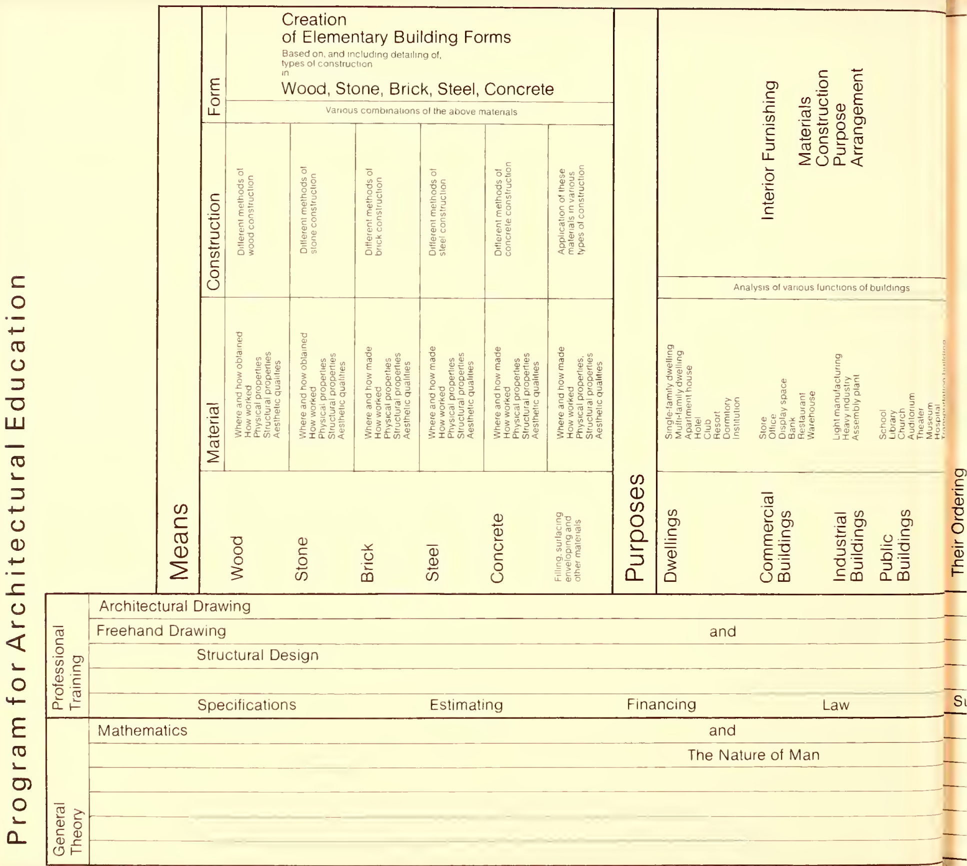
Architecture must certainly evolve to meet these changes; its opportunities and responsibilities are great. Mies presented the challenge of the future to architecture in these words:

> Architecture wrote the history of the epochs and gave them their names.
>
> Architecture is the real battleground of the spirit.(7)

1. See p. 26.
2. Ibid.
3. See p. 29.
4. Ludwig Mies van der Rohe, "Address on the Occasion of Receiving the Gold Medal of the American Institute of Architects", 1960. Quoted in Peter Carter, *Mies van der Rohe at Work,* London, 1974, p. 184.
5. See p. 28.
6. Mies van der Rohe, op. cit. in note 4.
7. See p. 62.

PROGRAM FOR ARCHITECTURAL EDUCATION

Professor Ludwig Mies van der Rohe (1937)



This Program for Architectural Education was prepared by Ludwig Mies van der Rohe in 1937, at the request of President Henry T. Heald of Armour Institute, to present his thoughts for a new curriculum in architecture. This document was developed by Mies with the assistance of Walter A. Peterhans, William T. Priestly and John B. Rodgers. It was presented to Heald in the Fall of 1937, and he approved it; Mies then accepted the position of Director of the Armour Department of Architecture.

Their Ordering
into Groups and Unified Communities

According to
the social requirements of

Dwelling
Work
Public administration
Recreation
Culture

and according to
the technical requirements of

Topography
Kind of building development
Hygiene and sanitation
Transportation

Reorganization of Existing Cities
Regional Planning

Planning and creating

Dependence upon the Epoch:

The Material Structure
The Functional Structure
The Spiritual Structure

An analysis of the supporting and
compelling forces of the times

Possible Principles of Order:

The Mechanical
As overemphasis of the material
and functional

The Idealistic
As overemphasis of the ideal

The Organic
As the determining factor for
the essential significance and
proper proportioning of the purposes
and functions of the various parts
and their relation to the whole

The Elements of Architectural Form:

Wall and Opening
Surface and Depth
Space and Solid
Material and Color
Light and Shadow
Lightness and Massiveness

The Structure of Architectural Form:

The dependence of architectonic structure upon
distinct forms of organization and working methods

The Obligation to Realize the Potentialities
of Organic Architecture

Architecture, Painting and Sculpture
as a Creative Unity

Architectural Drawing

Life Drawing

Structural Design

Mechanical Equipment and Design

Supervision — Office Practice

Natural Science

The Nature of Human Society

Analysis of Technics

Analysis of Culture

Culture as Obligatory Task

CHART OF THE IIT CURRICULUM

Sequence	First Year: First Semester	First Year: Second Semester	Second Year: Third Semester	Second Year: Fourth Semester
Architecture				
Planning				
Construction			Materials and Construction I	Materials and Construction II
Visual Training			Visual Training I	Visual Training II
Science-Engineering		Statics	Strength of Materials	Structures I — Timber
	Calculus and Analytic Geometry I	Calculus and Analytic Geometry II	Physics I	Physics II
History	History of Architecture I	History of Architecture II	Analysis of Art and Architecture I	Analysis of Art and Architecture II
Drawing	Life Drawing I	Life Drawing II	Life Drawing III	Life Drawing IV
	Architectural Drawing I	Architectural Drawing II		
General Education Program	Electives	Elective		Computer Science

This chart shows the courses of the curriculum as they were offered in the 1977-78 academic year. With minor variations, they still reflect the basic intentions of the original five-year curriculum which Mies and his colleagues had developed by 1941. The number of bars under each course-name indicates the number of credit-hours associated with it.

Third Year		Fourth Year		Fifth Year	
Fifth Semester	Sixth Semester	Seventh Semester	Eighth Semester	Ninth Semester	Tenth Semester
		Architecture I	Architecture II	Architecture III	Architecture IV
				Architectural Practice I	Architectural Practice II
Housing and Community Buildings I	Housing and Community Buildings II	City Planning I	City Planning II	Regional Planning Option (13 credit hours)	Regional Planning Option (13 credit hours)
Architectural Construction I	Architectural Construction II				
Visual Training III	Visual Training IV				
Structures II — Steel	Structures III — Concrete				
Mechanical Systems	Electrical Systems				
Analysis of Art and Architecture III	Analysis of Art and Architecture IV				
		Electives	Electives	Electives	Electives

INAUGURAL ADDRESS

As Director of the Department of Architecture at Armour Institute of Technology
Professor Ludwig Mies van der Rohe (1938)

All education must begin with the practical side of life.

Real education, however, must transcend this to mould the personality.

The first aim should be to equip the student with the knowledge and skill for practical life.

The second aim should be to develop his personality and to enable him to make the right use of this knowledge and skill.

Thus true education is concerned not only with practical goals but also with values.

By our practical aims we are bound to the specific structure of our epoch. Our values, on the other hand, are rooted in the spiritual nature of men.

Our practical aims measure only our material progress. The values we profess reveal the level of our culture.

Different as practical aims and values are, they are nevertheless closely connected.

For to what else should our values be related if not to our aims in life?

Human existence is predicated on the two spheres together. Our aims assure us of our material life, our values make possible our spiritual life.

If this is true of all human activity where even the slightest question of value is involved, how especially is it true of the sphere of architecture.

In its simplest form architecture is rooted in entirely functional considerations, but it can reach up through all degrees of value to the highest sphere of spiritual existence, into the realm of pure art.

In organizing an architectural education system we must recognize this situation if we are to succeed in our efforts. We must fit the system to this reality. Any teaching of architecture must explain these relations and interrelations.

We must make clear, step by step, what things are possible, necessary and significant.

If teaching has any purpose, it is to implant true insight and responsibility.

Education must lead us from irresponsible opinion to true responsible judgement.

It must lead us from chance and arbitrariness to rational clarity and intellectual order.

Therefore let us guide our students over the road of discipline from materials, through function, to

creative work. Let us lead them into the healthy world of primitive building methods, where there was meaning in every stroke of an axe, expression in every bite of a chisel.

Where can we find greater structural clarity than in the wooden buildings of old? Where else can we find such unity of material, construction and form?

Here the wisdom of whole generations is stored.

What feeling for material and what power of expression there is in these buildings!

What warmth and beauty they have! They seem to be echoes of old songs.

And buildings of stone as well: what natural feeling they express!

What a clear understanding of the material! How surely it is joined!

What sense they had of where stone could and could not be used!

Where do we find such wealth of structure? Where more natural and healthy beauty?

How easily they laid beamed ceilings on those old stone walls and with what sensitive feeling they cut doorways through them!

What better examples could there be for young architects? Where else could they learn such simple and true crafts than from these unknown masters?

We can also learn from brick.

How sensible is this small handy shape, so useful for every purpose! What logic in its bonding, pattern and texture!

What richness in the simplest wall surface! But what discipline this material imposes!

Thus each material has its specific characteristics which we must understand if we want to use it.

This is no less true of steel and concrete. We must remember that everything depends on how we use a material, not on the material itself.

Also new materials are not necessarily superior. Each material is only what we make it.

We must be as familiar with the functions of our buildings as with our materials. We must analyze them and clarify them. We must learn, for example, what distinguishes a building to live in from other kinds of building.

We must learn what a building can be, what it should be, and also what it must not be.

We shall examine one by one every function of a building and use it as a basis for form.

Just as we acquainted ourselves with materials and just as we must understand functions, we must become familiar with the psychological and spiritual factors of our day.

No cultural activity is possible otherwise; for we are dependent on the spirit of our time.

Therefore we must understand the motives and forces of our time and analyze their structure from three points of view: the material, the functional and the spiritual.

We must make clear in what respects our epoch differs from others and in what respects it is similar.

At this point the problem of technology of construction arises.

We shall be concerned with genuine problems—problems related to the value and purpose of our technology.

We shall show that technology not only promises greatness and power, but also involves dangers; that good and evil apply to it as to all human actions; that it is our task to make the right decision.

Every decision leads to a special kind of order.

Therefore we must make clear what principles of order are possible and clarify them.

Let us recognize that the mechanistic principle of order overemphasizes the materialistic and functionalistic factors of life, since it fails to satisfy our feeling that means must be subsidiary to ends and our desire for dignity and value.

The idealistic principle of order, however, with its over-emphasis on the ideal and the formal, satisfies neither our interest in simple reality nor our practical sense.

So we shall emphasize the organic principle of order as a means of achieving the successful relationship of the parts to each other and to the whole.

And here we shall take our stand.

The long path from material through function to creative work has only a single goal: to create order out of the desperate confusion of our time.

We must have order, allocating to each thing its proper place and giving to each thing its due according to its nature.

We would do this so perfectly that the world of our creations will blossom from within.

We want no more; we can do no more.

Nothing can express the aim and meaning of our work better than the profound words of St. Augustine: "Beauty is the splendor of Truth."

THE ARCHITECTURE CURRICULUM AT IIT

Professor Ludwig Mies van der Rohe (1941)

The Institute offers a five-year course leading to the degree of Bachelor of Architecture. In the fifth year the student has the option of majoring in Architecture or City Planning. The curriculum of the Architectural Department is designed not only to equip the student with the knowledge and ability required for the professional practice of architecture but also to give him a cultural education to enable him to make the right use of this knowledge and ability.

Architecture in its simplest forms is concerned primarily with the useful. But it extends from the almost purely practical until in its highest forms it attains its fullest significance as pure art. This relationship leads to a curriculum which makes clear, step by step, what is possible in construction, what is necessary for use, and what is significant as art.

This is accomplished in the curriculum by so interrelating the different fields of instruction that the student is always conscious of, and is always working in the whole sphere of architecture in its fullest sense of designing a structure for a purpose, ordering it so that it attains significance as art, and working out the conception so that it may be realized in the executed building.

At first, the courses are concentrated on training the student to draw, not only to master this technical means of expression, but also to train his eye and hand. Throughout the curriculum the student is given training to develop a feeling for the expression of proportion and form as the enduring basis of architecture, however much its means and purposes may change. Material, texture, color, rhythm, structure, and mass are the elements with which the student works. He strives to bring them into a rich translucent relationship and balance in space. The method is to work within clear and definite restrictions given with the problem, and yet to achieve richness and unity of expression.

Next, the student will study the materials and construction of simple wood, stone and brick buildings and then the structural possibilities of steel and concrete. This work is studied in such a way that the significant relationship between the materials, the construction, and the architectural expression is made apparent.

The knowledge of materials and construction leads to a study of function. The functions of the principal kinds of buildings are studied on the basis of an exact analysis. This analysis establishes wherein each architectural problem is distinguished from every other; wherein the real essence of each problem lies. After the essentials of each problem have been clearly established, buildings are designed whose conception and expression are based on these essentials.

The study of function is carried beyond individual buildings into groups of buildings and then into communities in the field of city planning in order to demonstrate the interdependence of all building in relation to the city as an organic whole.

The curriculum leads naturally from the study of the means with which one builds and the purposes for which one builds into the sphere of architecture as an art. This is the synthesis of the entire curriculum; the fundamentals of the art of architecture; the artistic principles, the means, and their expression in the executed building. The student applies the principles in free creative architectural design and works his

designs through in collaboration with the structural design and construction staffs of the department.

In conjunction with the curriculum there is a clarification of the cultural situation today so that the student may learn to recognize the sustaining and compelling forces of his times, and to comprehend the intellectual and spiritual environment in which he lives. The material, intellectual, and cultural aspects of our era are explored to see wherein they are similar to those of former epochs and wherein they differ from them. The buildings of the past are studied so that the student will acquire from their significance and greatness a sense for genuine architectural values, and because their dependence upon a specific historical situation must awaken in him an understanding for the necessity of his own architectural achievement.

DRAWING SEQUENCE

The curriculum begins with the drawing sequence. Drawing has long been a fundamental means of communicating architectural facts and ideas. The curriculum views drawing as an architectural language, as a basic instrument the student must master for the development of his subsequent knowledge. Drawing also relates the working of mind and hand; a clear drawing, crystallized to essential significant lines, can only be the result of clear thinking.

The sequence starts with the study of line as the primary element of drawing. The line forms a common element between the language of architecture and the more abstract languages of physics and mathematics which have shaped the industrial world. The student learns to produce accurate and expressive lines, always aware that they are not ends in themselves, but a means toward the realization of architecture.

Using the line to make drawings that are accurately constructed, the students begin to develop a sense of discipline, of clarity and precision. But they learn not only to make drawings that are mechanically correct, they begin to distinguish their aesthetic qualities as well. The character of the line, its texture, gradation and density are carefully studied and controlled.

Having first developed the line in a clear abstract manner, the sequence goes on to consider how line and drawing can be used to define and manipulate space in two-dimensional form. The study of geometrical projections helps the student toward an intuitive feeling for space. Using drawing to define space begins the joint development of mind, hand and eye in a rational process.

Parallel to this development of precise drawing with instruments, the student also does free-hand drawing from life. Again line is emphasized, using it to convincingly interpret and record the objects seen. This process of perception and abstraction of form further develops the student's spatial sensitivity.

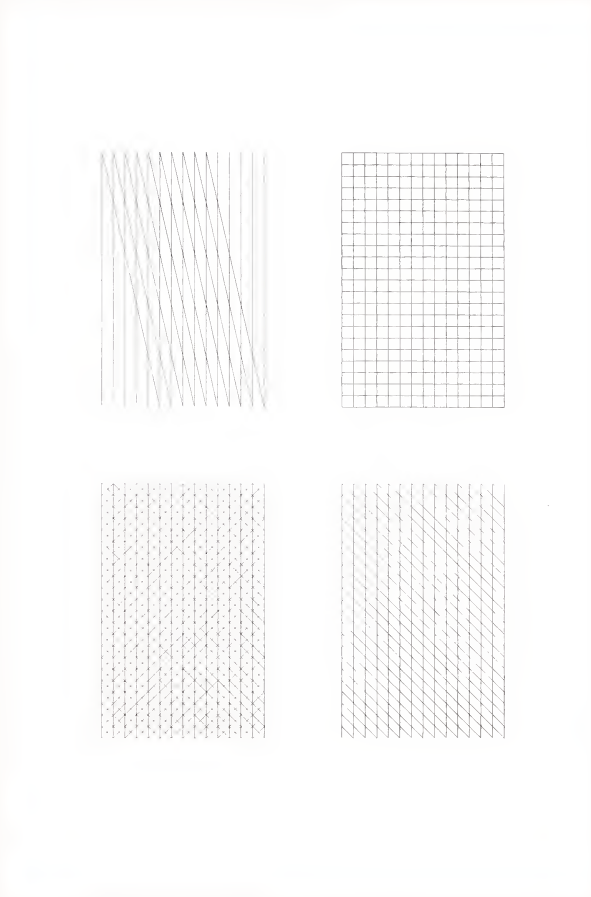
The exercises of the drawing sequence begin in the first semester with the study of straight pencil lines. An example of a beginning problem is an array of parallel lines alternating in three different lengths. The student concentrates on making lines of uniform weight, with precise terminations. Another early exercise includes twelve arrays of lines in four different spacings and three different weights. This introduces control of spacing and density to give proper tonal value to each array. A further problem is comprised of four rectangular arrays of lines, one of horizontal and vertical lines, and the other three of different combinations of horizontal and diagonal lines. This requires precision in the control of line weights, spacing and intersections. Then curved lines are developed in several exercises. One example includes a series of nested circles of diminishing size, all tangent to each other at one point, developing precise control of the compass. Others involve the construction of equiangular or logarithmic spirals, a problem in the accurate joining of arcs of different radii. Once these problems in straight and curved lines have been done in pencil, they are repeated again in ink so the student masters this medium. Another problem done exclusively in ink involves parallel arrays of lines of varying width, arranged to form a uniform progression in size. There is also some limited use of colored inks.

After this initial preparation in the second semester, the line is then applied to the study of spatial qualities. The student starts with exercises in descriptive geometry. The initial problem is to define the

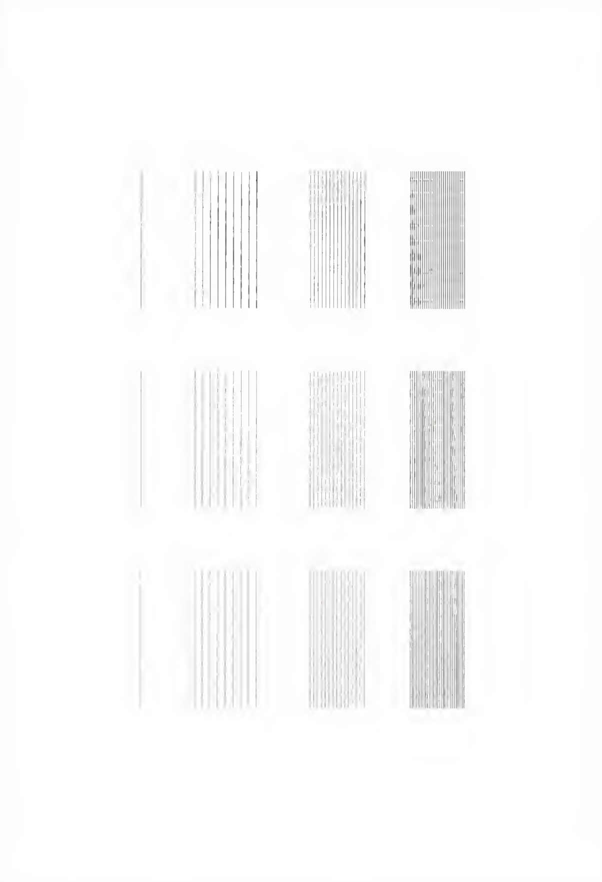
position of a line in space, by projection on to various reference planes. Groups of lines in different orientations are described in further exercises. The various forms of axonometric projection are then studied. Each type of projection is applied to a different problem of describing a three-dimensional object such as a spiral staircase, a contour map, or the penetration of sunlight into a room. Finally, perspective is studied, beginning with a set of illustrative problems showing the construction of one-, two- and three-point views. The concluding exercise is to make a detailed perspective of the interior or exterior of an actual building, conveying clearly the quality of space it defines.

The problems of the life drawing portion of the drawing sequence are used to illustrate a wide variety of techniques; pencil, pen, pastel and brush are used. The subjects include studio drawings of still lifes and live models, and field sketches of plants, animals, landscapes and buildings. Again the concern is the development of line, together with form, and their use to perceive and define space.

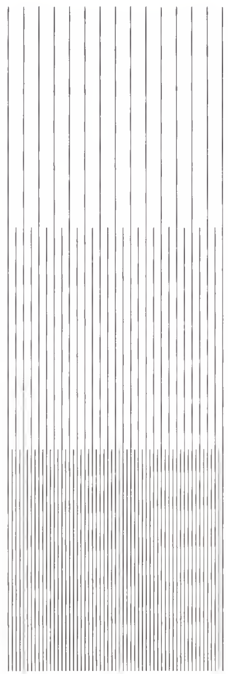
In conclusion, the sequence seeks to develop drawing not only as a useful tool, but also as a creative means of stimulating and expressing the student's architectural imagination.



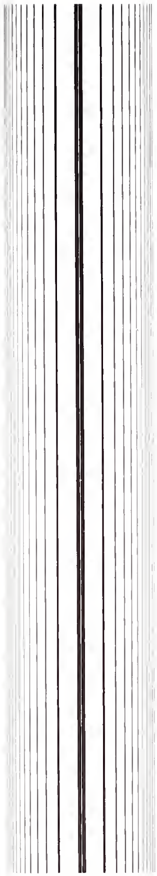
Arrays of straight lines in vertical, diagonal and horizontal orientations. Pencil on strathmore paper, 20 in. by 30 in., first semester.



Arrays of straight lines of varying spacing and weight. Pencil on strathmore paper, 20 in. by 30 in., first semester.

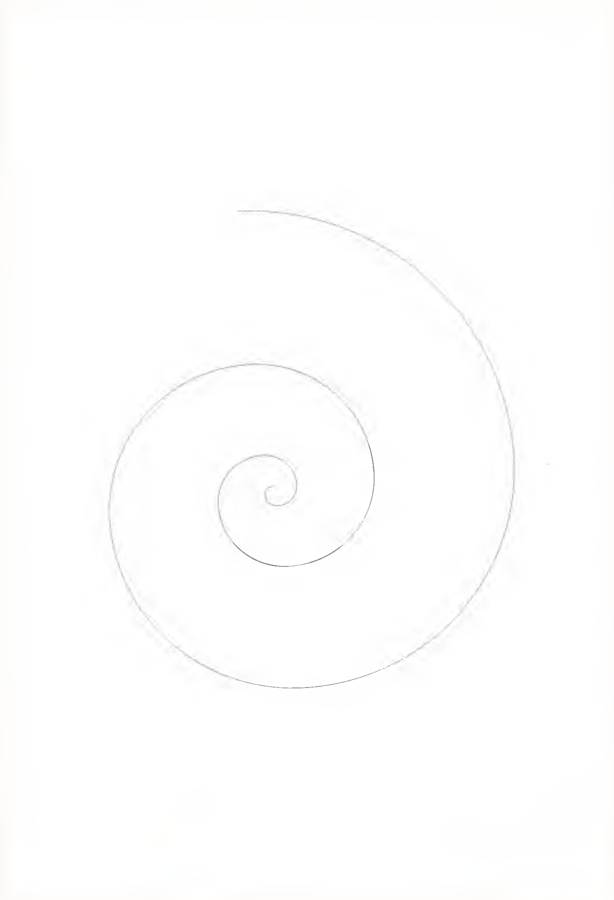


Array of straight lines of three different lengths. Ink on strathmore paper, 20 in. by 30 in., first semester.



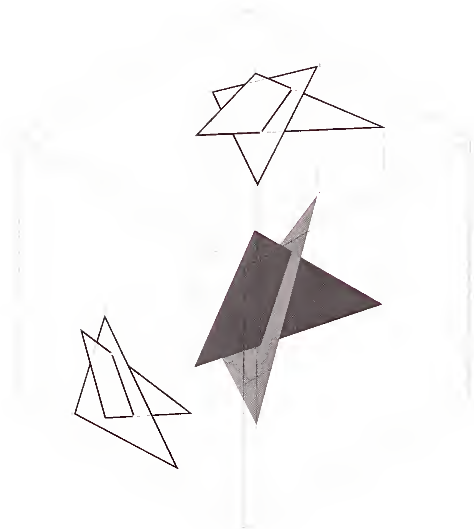
Symmetrical array of lines of diminishing width and spacing. Ink on strathmore paper, 20 in. by 30 in., first semester.

Line of increasing width in the form of a logarithmic spiral. Ink on strathmore paper, 20 in. by 30 in., first semester.

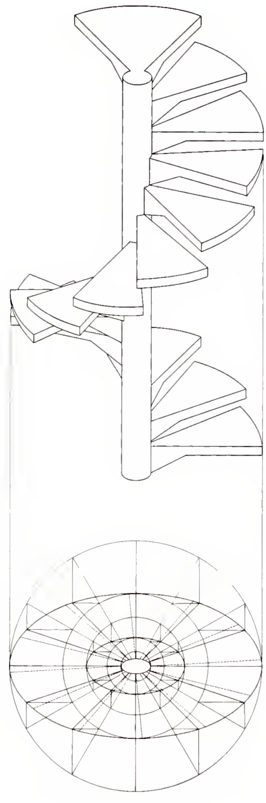


Line in the form of an equiangular spiral. Ink on strathmore paper, 20 in. by 30 in., first semester.

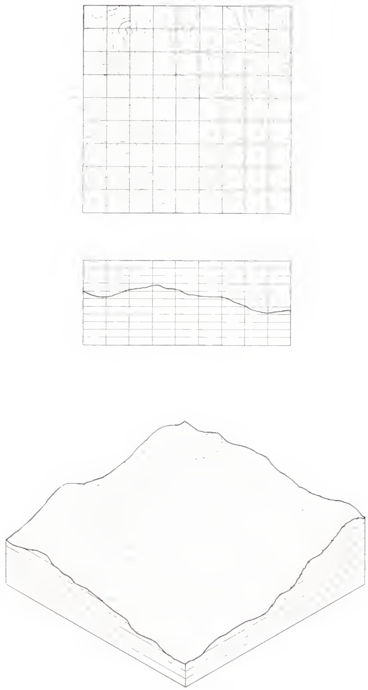
Two series of reversed tangent half-circles.
Ink on strathmore paper, 20 in. by 30 in.,
first semester.



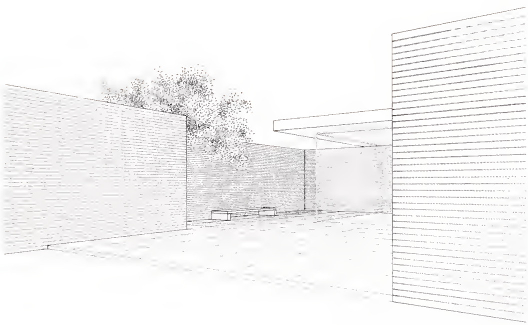
Isometric projection showing the orthogonal projections on two reference planes of two triangular planes in space. Ink and collage on strathmore paper, 20 in. by 30 in., second semester.



Isometric projection of a spiral staircase.
Ink on strathmore paper, 20 in. by 30 in.,
second semester



Plan, section and isometric projection of a contour map. Ink on strathmore paper. 20 in. by 30 in., second semester.



Perspective view, House for Berlin Building Exposition (Ludwig Mies van der Rohe, 1931). Pencil on strathmore paper, 20 in. by 30 in., second semester.

Life drawing. Ink on paper, 20 in. by 30 in., second semester.

VISUAL TRAINING SEQUENCE

Visual perception plays a major role in experiencing and creating architecture. Not only is it important in the literal sense of seeing, but in the way it can intuitively inform the architect's intellectual insight and judgement of aesthetic value.

The visual training sequence further refines and intensifies the student's visual faculties, a process already begun in the drawing sequence. It continues the mutual development of mind, hand and eye, applying visual perception to the making of rational aesthetic judgement. It seeks to develop this critical capacity by the isolation and analysis of various aesthetic qualities, and the achievement of aesthetic harmony under restrictive conditions. The work of the sequence consists of a series of abstract exercises in the making and judging of proportion, form, rhythm, texture, color, mass and space. Each exercise is a controlled experiment with well-defined limitations in which the student, by a comparative method, explores a particular visual quality in depth, and seeks an expression of aesthetic unity within the given variables of the problem.

The method of study in the visual training sequence involves the comparison of different versions of each problem, adjusting the problem variables one at a time, and analyzing the visual changes that occur. It soon becomes apparent that serious visual judgements can be made only with precisely executed visual elements. Through this process the student contemplates, evaluates and absorbs the visual experiences evoked by adjusting the problem elements, seeking to fuse the elements into a harmonious whole. Of course there are many possible levels of refinement in these exercises. Ideally the end result should be a dynamically balanced, visually coherent relationship of elements, an aesthetic unity to which nothing can be added or subtracted. At the same time all evidence of technique should have disappeared, leaving a composition that appears natural and unstrained.

The problems of the visual training sequence are executed on standard mass-produced 20 in. by 30 in. white illustration board; it forms a common element in all the exercises. In the third semester where the sequence begins, three problems are devoted to the study of proportion using black and white elements. The fourth semester covers three problems involving form and proportion, which also evoke a three-dimensional spatial quality in their representation on the white board. Two dimensional black and white texture problems are studied in the fifth semester. The sequence concludes in the sixth semester with two exercises in the use of color and texture.

The initial problem in the third semester involves the placement of two black lines on the board, one vertical and one horizontal, dividing the board into four rectangles of different proportion. The variables are the widths of the lines and their location. The student seeks to reach a balance in which all the elements, the lines and the rectangles, have a harmonious relationship to each other and to the board itself. In the next problem, three arrays of thin black lines are placed vertically on the board in three horizontal bands; three rows of white rectangles are thus defined between the lines. The variables are the height, number and proportion of the rectangles in each row, and the thickness of the lines. Here a visual unity is sought in the interrelations of the varying proportions of the rectangles and their overall relation to the board. The third problem consists of one row of black rectangles placed on the board, which in turn define white rectangles between them. The aim of this exercise is to clearly define all the rectangles, both white and black, harmonizing their proportions and rhythmic structure in relation

to each other and to the surrounding board.

The fourth semester begins with an exercise in which a black curve that continuously changes width and direction is placed on the board, suggesting that it is hovering in a white space viewed through the outline of the board. The variables here are the rate of change, direction and movement of the curve, and the volumes and spaces it implies, which the student seeks to balance with the board's defining edge. The second problem is a composition of straight pencil lines, connected between generating lines, which define warped surfaces suspended in a space seen through the perimeter of the board. The problem is similar to that of the curve in space, involving the visual integration of the location, rate of change and sense of movement of the warped surfaces with the spaces they evoke and their overall relation to the board that contains them. In the concluding problem involving the third dimension, colored papers are cut and arranged on the board to suggest a group of planes in space. The planes may be represented as opaque or transparent. The aim here is to define and animate the white space of the board, while maintaining a precise, coherent relationship among the planes themselves and the boundaries of the board.

Two problems in visual texture, both done in black and white, are studied in the fifth semester. In the first a texture pattern is built up with repeated elements of black watercolor, applied to the board with strokes of a brush. The element must grow out of the nature of the medium, clearly expressing it, allowing the color applied by the brush to be balanced and lighted by the white spaces that show through between it and neighboring elements. The overall structure of the texture, its rhythm, density and variations should be uniquely derived from the chosen element, and carefully controlled to achieve an aesthetic whole. The second problem has a similar aim, only the color is applied with some instrument other than a brush.

In the sixth semester the student explores color and texture in two final problems. The first involves the placement of twelve quadrilaterals of colored, textured materials in a three by four array on the board. Paper is the most frequently used material, but fabrics, wood veneer and sheet metals are also utilized. In selecting and testing many combinations of materials, the student seeks a harmonious ensemble of color and texture, further interrelated by the shapes of the quadrilaterals and the white spaces between them. The last exercise consists of free-formed shapes of textured color, created by placing drops of watercolor or ink on a wet board. Often the shapes take the form of ellipses, generated by the outward diffusion of color particles through the wet fibers of the paper. Other elements are formed by the liquid flow of color over the board's surface. In this very complex exercise, the achievement of visual unity is sought in the relationship of color, texture, form and fluid movement within the defining rectangle of the board.

Although the finished plates are the end result of the students' work, the most important aspect of the visual training sequence is the enhancement of the students' visual perception, developing their sense of quality and precision, their mental discipline and critical capacity.

The ten types of visual training exercises shown on pages 49-58 were originally developed by Professor Walter Peterhans.

PETERHANS' VISUAL TRAINING COURSE AT IIT

Professor Ludwig Mies van der Rohe (1965)

When friends and students of Walter Peterhans decided to publish a selection of plates from the Visual Training Course he developed at Illinois Institute of Technology, I was asked to write an introduction to the publication because of the part I had played at the inception of the course.

In 1930 when I took over the Bauhaus in Dessau, Walter Peterhans was head of the Department of Photography. There I became acquainted with his painstaking work with the students, and the great discipline he taught and demanded of them. Not only was he a photographer second to none, but a strong personality with a broad education in many fields, notably in mathematics, history and philosophy.

When I came later to Chicago to head the Department of Architecture at Illinois Institute of Technology, I asked Ludwig Hilberseimer, a leading theoretician in City Planning, and Walter Peterhans to become members of the faculty and to work closely with me in initiating our own curriculum for training and educating young architects.

Confronted with the problem of changing a school containing students at different levels, from freshmen to graduates, it was obvious that the only possible starting point was at the freshman level. As properly trained freshmen progressed from level to level, a curriculum conforming to our ideas and consonant with our aims could gradually be evolved.

It was my conviction that any freshman, given the right exercises and guidance, could become a good draftsman in one year. I asked Peterhans to set up a course to this end, so that at the upper level we would have students to our liking. He succeeded admirably, and in the course he organized a foundation was laid for clean, clear, exact work—the basic prerequisite for what was to follow.

Somewhat later I made the startling discovery that although the students appeared to understand what I said about the importance of proportion, they did not demonstrate the slightest sense for it in their exercises. I realized that their eyes simply could not see proportion. This problem was discussed with Peterhans and we decided to introduce a new course, especially designed for training the eyes and forming and maturing a sensitivity for proportion. It was to be a continuation of the basic freshman course, but starting at the sophomore level. To achieve this end, Peterhans developed the course he called Visual Training. The effect of the Visual Training course was a radical change in the whole mental attitude of the students. All fussiness and sloppiness disappeared from their work; they learned to discard any line that did not fulfill a purpose, and a real understanding of proportion emerged. Although specially gifted students sometimes produced plates that would have enriched the collection of a museum, the purpose of the course was never to produce works of art, but to train the eyes.

VISUAL TRAINING

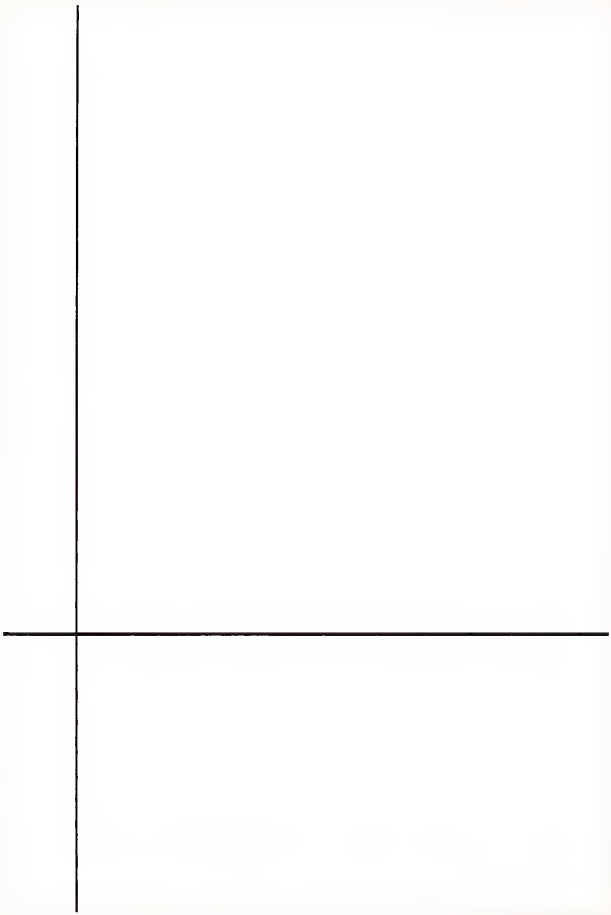
Professor Walter Peterhans

'Visual Training' is a course which serves to train the eye and sense of design and to foster aesthetic appreciation in the world of proportions, forms, colors, textures and spaces.

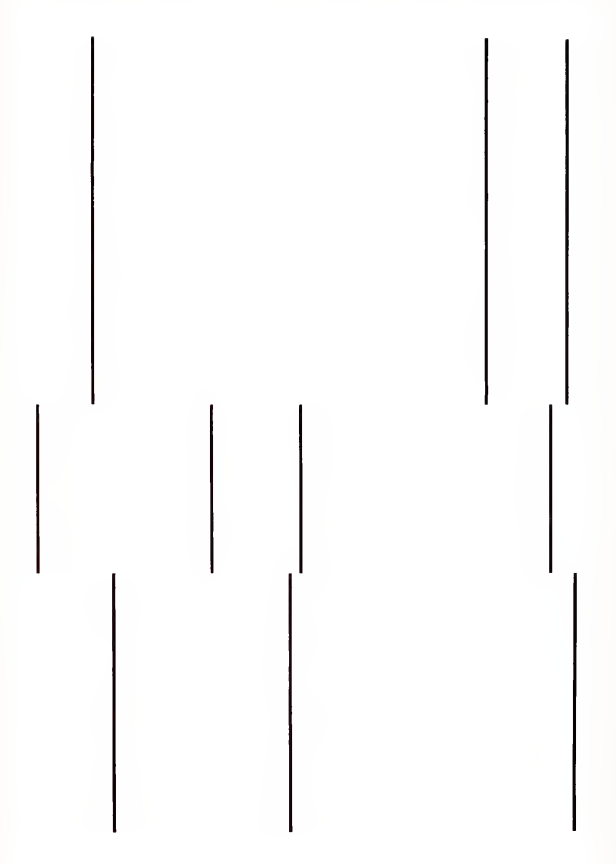
It comprises exercises which are on the one hand sufficiently abstract to show visual qualities in isolation from one another—in crystallized form as it were—disentangled from the complexities in which they occur in architecture, in industrial forms and in the fine arts, and yet at the same time concrete enough to allow these and variations to be tied to specific technical media and prescribed conditions. And finally copious and flexible enough to exist entirely in their own right in that they are pure representations of visual qualities and relationships, intensified to the maximum, aspiring to maturity and fullness, so that they are, as of their own accord, consummated in free harmony and ultimately allow technical media and conditions to be forgotten. By nature visual training is one of the bases for the specialized work of the architect and the industrial and graphic designer. It is no substitute for their work but stimulates, permeates and controls it in exercises which can be repeated from time to time when the need for them is felt. They put things in perspective and allow them to be approached again at a deeper level. The course affords access to the common sources from which the formal values of the fine arts and architecture take their rise, and likewise the ideas and concepts which are indispensable for the analysis and criticism of a work of art.

We attach incomparably more importance to visual training than freehand drawing or drawing from the nude. Sketching is indispensable as a means of recording an idea, clarifying it and communicating it to others; but as a means of fostering insight and stimulating ideas visual training has quickly shown itself to be a greatly superior method since it begins at a deeper level in training the eye for architectural conception and quality and for formal creation in the widest sense. (It has therefore had an important influence on perspective, representation, and model building in the architectural department and has in turn embodied valuable suggestions made in that quarter.)

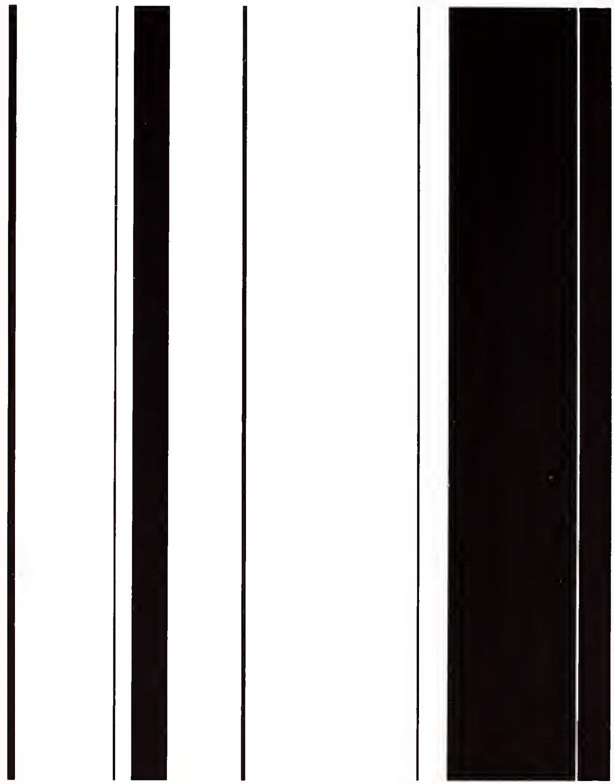
We have studiously avoided arbitrariness in the name of personal freedom of expression. We do not mould clay with our elbows, nor do we entertain any illusions about the significance of giant wheels made of folded paper. We make experiments but we deliberately refrain from making all possible experiments. Even in practical physics experiments are directed, otherwise we should never have progressed beyond the Magdeburg hemispheres and patterns of iron filings in a magnetic field. Nevertheless we have made radical changes in traditional methods and at the same time we have subjected them to a permanent check on their utility. We endeavor to isolate aesthetic qualities from one another and to display them in an intensified form. We then combine them in a quite different whole in which they are transcended—say, in a space which is generated out of themselves. This calls for the strictest mental discipline and critical acumen—characteristics which are much rarer in students than the desire to indulge in free experimentation, and which must therefore be all the more deliberately fostered. This combination of a sense of quality with mental discipline and critical acumen is what we are really anxious to cultivate in the student and what determines our working method.



Two black lines of differing width divide the board into four rectangles of different proportions. Balance is sought between the lines, the rectangles and the board itself. Black paper on strathmore board, 20 in. by 30 in., third semester.

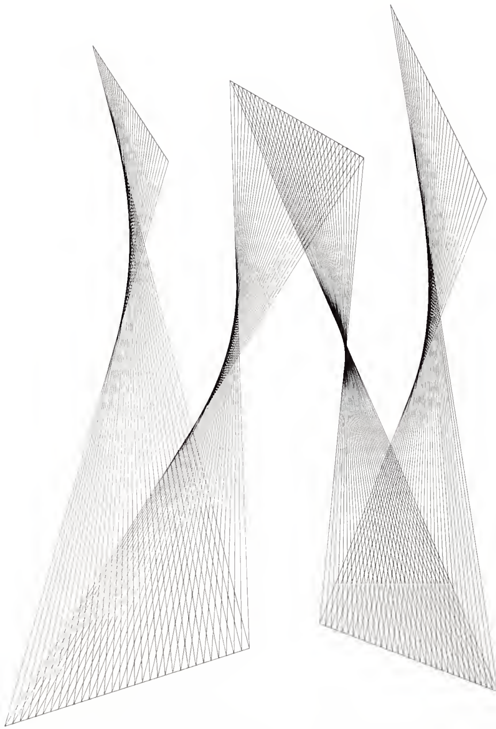


Thin black lines define three rows of white rectangles. Visual unity dependent on the flowing interrelation of the various proportions of the rectangles and the board. Black paper on strathmore board, 20 in. by 30 in., third semester.



This exercise defines a row of black and white rectangles, relating their proportion and rhythmic structure to the surrounding board and to each other. Black paper on strathmore board, 20 in. by 30 in., third semester.

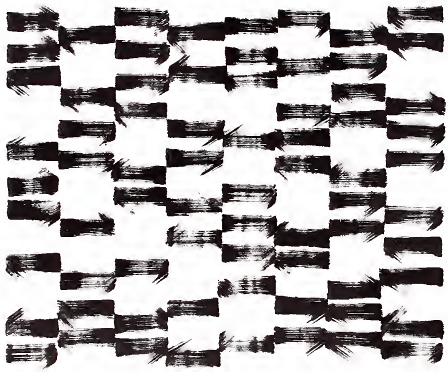
Black curves, which continuously change direction and width, hover in a white space viewed through the outline of the board. Black paper on strathmore board, 20 in. by 30 in., fourth semester.



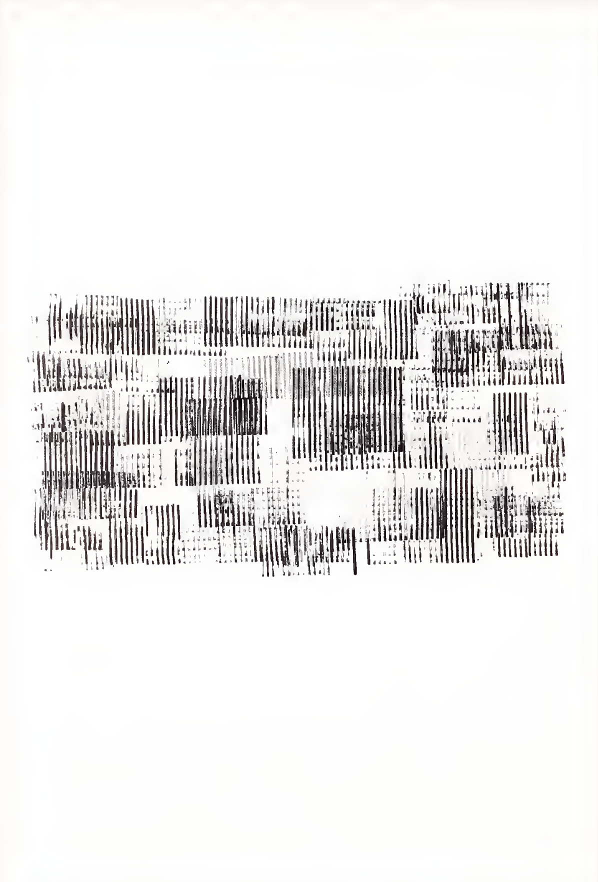
A composition of straight lines, defining an interconnected series of warped surfaces suspended in a space seen through the perimeter of the board. Pencil on strathmore board, 20 in. by 30 in., fourth semester.

Opaque and transparent colored planes animate the white space of the board, maintaining a coherent relationship between themselves and the board's boundaries. Colored paper on strathmore board, 20 in. by 30 in., fourth semester.

Twelve various materials chosen to form a harmonious ensemble of color and texture are further interrelated by their quadrilateral shapes and the white spaces between them. Collage of wood and paper on strathmore board, 20 in. by 30 in., sixth semester.



Visual texture in black and white, built up with repeated elements formed by strokes of a brush. The texture is lighted and balanced by the white spaces that show through it. Black watercolor on strathmore board, 20 in. by 30 in., fifth semester.



Visual texture in gradations of black and white, similar to page 56 but here the color is applied with some instrument other than a brush. Black watercolor on strathmore board, 20 in. by 30 in., fifth semester.

Free-form shapes of textured color, created by placing drops of watercolor on a wet board. A complex exercise seeking visual unity in the relationship of color, texture, form and fluid movement. Watercolor on strathmore board, 20 in. by 30 in., sixth semester.

HISTORY SEQUENCE

The study of history in architecture, as in any field, seeks to develop an understanding of the possibilities of the present and the future through analysis of the achievements of the past.

Mies suggested in his Inaugural Address of 1938 that his aims for the curriculum, and indeed for the making of architecture in general, were derived in part from a study of architectural history, and his interpretation of it. This was a theme that he had addressed before in his essay "Architecture and the Times" of 1924, and would return to again in his statement on "Architecture and Technology" in 1950.

In 1924, he said:

> Greek temples, Roman basilicas and medieval cathedrals are significant to us as creations of a whole epoch rather than as works of individual architects. . . . They are pure expressions of their time. Their true meaning is that they are symbols of their epoch.
>
> Architecture is the will of the epoch translated into space. . . . It must be understood that all architecture is bound up with its own time, that it can only be manifested in living tasks and in the medium of its epoch. In no age has it been otherwise.
>
> It is hopeless to try and use the forms of the past in our architecture. Even the strongest artistic talent must fail in this attempt.(1)

In his Inaugural Address, he further expanded on this relation of architecture to its time:

> Just as we acquainted ourselves with materials and just as we must understand functions, we must become familiar with the psychological and spiritual factors of our day.
>
> No cultural activity is possible otherwise; for we are dependent on the spirit of our time.
>
> Therefore we must understand the motives and forces of our time and analyze their structure from three points of view: the material, the functional and the spiritual.
>
> We must make clear in what respect our epoch differs from others and in what respects it is similar.(2)

And in 1950 he spoke of a major force that influences our time:

> Technology is rooted in the past. It dominates the present and tends into the future. It is a real historical movement — one of the great movements which shape and represent their epoch. It can be compared only with the classic discovery of man as a person, the Roman will to power, and the religious movement of the Middle Ages. Technology is far more than a method, it is a world in itself. . .
>
> Architecture depends on its time. It is the crystallization of its inner structure, the slow unfolding of its form.(3)

The history sequence explores the great architecture of the past in relation to its epoch, to the cultural context and civilization in which it was embedded. Employing the rational method of the curriculum as a whole, it first considers the architectural technology of an epoch: *how* did they build? what methods and materials did they have available? Next it considers *what* was built, what functions and needs did they serve, what building types did they evolve? Finally one considers how the great buildings of an epoch achieved significance as art. How did they express the dominant ideas of their time, and how did they harmonize these ideas with the enduring aspects of clear construction, proportion, refinement and spatial quality. How did they become "symbols of their epoch" by a process of objective development, not by whimsical or fortuitous design.

The history sequence begins with a course in the first and second semester giving a general survey of architectural history from earliest times to the present. The emphasis on subject matter can vary from year to year. One may concentrate on the major building types of certain epochs, such as the Greek temple or the Gothic cathedral. Or one may study the development of a particular structural type (the dome, for example) through many different epochs, seeing how it was affected by changing materials, functions and ideas. The lectures are often supplemented by each student making a drawing of a different building studied, all done at the same scale. The drawings are then exhibited together, giving a comprehensive view of the semester's work. A year-long course in the history of painting and sculpture follows, with particular emphasis on their relationship to architecture. The sequence is concluded with a course concentrating on the architecture of the nineteenth and early twentieth centuries.

In addition to the formal courses of the history sequence itself, continual references are made to history in other sequences, particularly construction, planning and architecture. In construction for example, medieval half-timber buildings may be studied to help clarify the development of structural systems in wood. The evolution of earlier city plans is reviewed to show how contemporary problems in the planning sequence may be approached. In the architecture sequence, major emphasis is placed on the understanding of our epoch's place in history, and how this shapes our buildings.

The history sequence seeks to impress on the student the importance of making buildings of true value in materials, function and significance, by the example of the great buildings of the past. It helps to arouse their enthusiasm for architecture as a serious and profound activity, and to give them a better understanding of its true nature. As Mies said in 1941:

> The buildings of the past are studied so that the student will acquire from their significance and greatness a sense for genuine architectural values, and because their dependence upon a specific historical situation must awaken in him an understanding for the necessity of his own architectural achievement.(4)

1. See p. 61.
2. See p. 27.
3. See p. 62.
4 See p. 30.

ARCHITECTURE AND THE TIMES

Professor Ludwig Mies van der Rohe (1924)

Greek temples, Roman Basilicas and medieval cathedrals are significant to us as creations of a whole epoch rather than as works of individual architects. Who asks for the names of these builders? Of what significance are the fortuitous personalities of their creators? Such buildings are impersonal by their very nature. They are pure expressions of their time. Their true meaning is that they are symbols of their epoch.

Architecture is the will of the epoch translated into space. Until this simple truth is clearly recognized, the new architecture will be uncertain and tentative. Until then it must remain a chaos of undirected forces. The question as to the nature of architecture is of decisive importance. It must be understood that all architecture is bound up with its own time, that it can only be manifested in living tasks and in the medium of its epoch. In no age has it been otherwise.

It is hopeless to try to use the forms of the past in our architecture. Even the strongest artistic talent must fail in this attempt. Again and again we see talented architects who fall short because their work is not in tune with their age. In the last analysis, in spite of their great gifts, they are dilettantes; for it makes no difference how enthusiastically they do the wrong thing. It is a question of essentials. It is not possible to move forward and look backwards; he who lives in the past cannot advance.

The whole trend of our time is toward the secular. The endeavors of the mystics will be remembered as mere episodes. Despite our greater understanding of life, we shall build no cathedrals. Nor do the brave gestures of the Romantics mean anything to us, for behind them we detect their empty form. Ours is not an age of pathos; we do not respect flights of the spirit as much as we value reason and realism.

The demand of our time for realism and functionalism must be met. Only then will our buildings express the potential greatness of our time; and only a fool can say that it has no greatness.

We are concerned today with questions of a general nature. The individual is losing significance; his destiny is no longer what interests us. The decisive achievements in all fields are impersonal and their authors are for the most part unknown. They are part of the trend of our time toward anonymity. Our engineering structures are examples. Gigantic dams, great industrial installations and huge bridges are built as a matter of course, with no designer's name attached to them. They point to the technology of the future.

If we compare the mammoth heaviness of Roman aqueducts with the web-like lightness of modern cranes or massive vaulting with thin reinforced concrete construction, we realize how much our architecture differs from that of the past in form and expression. Modern industrial methods have had a great influence on this development. It is meaningless to object that modern buildings are only utilitarian.

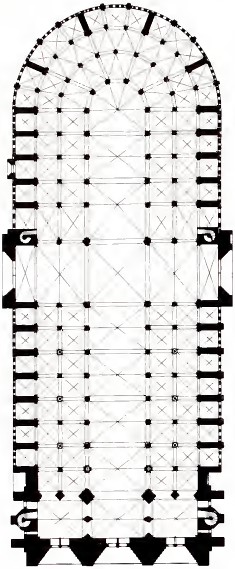
If we discard all romantic conceptions, we can recognize the stone structures of the Greeks, the brick and concrete construction of the Romans and the medieval cathedrals all as bold engineering achievements. It can be taken for granted that the first Gothic buildings were viewed as intruders in their Romanesque surroundings.

Our utilitarian buildings can become worthy of the name of architecture only if they truly interpret their time by their perfect functional expression.

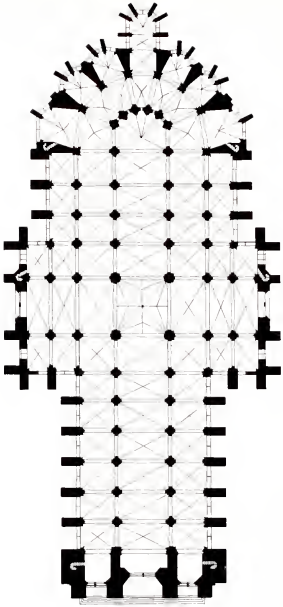
ARCHITECTURE AND TECHNOLOGY

Professor Ludwig Mies van der Rohe (1950)

Technology is rooted in the past.
It dominates the present and tends into the future.
It is a real historical movement —
one of the great movements which shape and represent their epoch.
It can be compared only with the Classic
discovery of man as a person,
the Roman will to power,
and the religious movement of the Middle Ages.
Technology is far more than a method,
it is a world in itself.
As a method it is superior in almost every respect.
But only where it is left to itself as in
gigantic structures of engineering, there
technology reveals its true nature.
There it is evident that it is not only a useful means,
that it is something, something in itself,
something that has a meaning and a powerful form —
so powerful in fact, that it is not easy to name it.
Is that still technology or is it architecture?
And that may be the reason why some people
are convinced that architecture will be outmoded
and replaced by technology.
Such a conviction is not based on clear thinking.
The opposite happens.
Wherever technology reaches its real fulfillment,
it transcends into architecture.
It is true that architecture depends on facts,
but its real field of activity is in the realm of significance.
I hope you will understand that architecture
has nothing to do with the inventions of forms.
It is not a playground for children, young or old.
Architecture is the real battleground of the spirit.
Architecture wrote the history of the epochs
and gave them their names.
Architecture depends on its time.
It is the crystallization of its inner structure,
the slow unfolding of its form.
That is the reason why technology and architecture
are so closely related.
Our real hope is that they grow together,
that someday the one be the expression of the other.
Only then will we have an architecture worthy of its name:
Architecture as a true symbol of our time.



A



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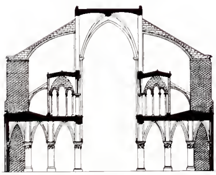

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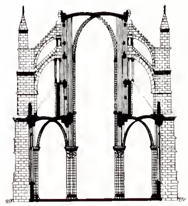
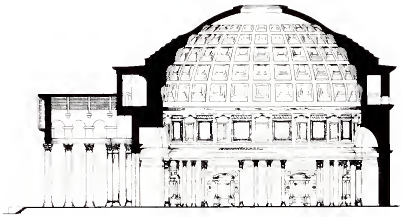


D

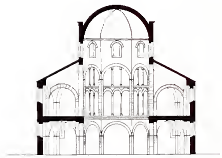
Plan **A** and transverse section **B** of the Cathedral of Notre Dame, Paris (1163-1235) and plan **C** and transverse section **D** of Amiens Cathedral (1220-1288). These drawings were made as a part of series studying the development of cathedrals and other medieval building types in the first-year history of architecture course. Ink on strathmore board, second semester.

A

D



B



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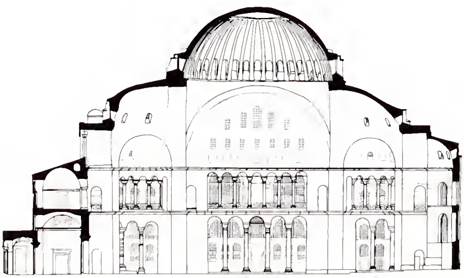
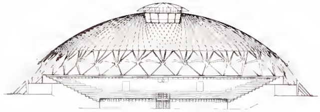


C

F

Part of a series of drawings made in the first-year history of architecture course forming a study of the development of the dome through various epochs. Shown are sections of the Treasury of Atreus, Mycenae (c.1400 BC) **A**, the Pantheon, Rome (120-202) **B**, Hagia Sophia, Istanbul (Anthemius of Tralles and Isodorus of Miletus, 532-537) **C**, Pazzi Chapel, Florence



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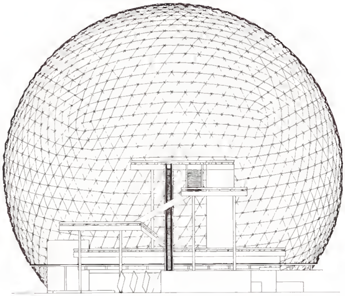

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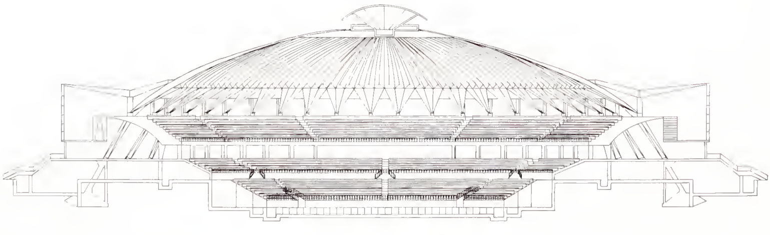
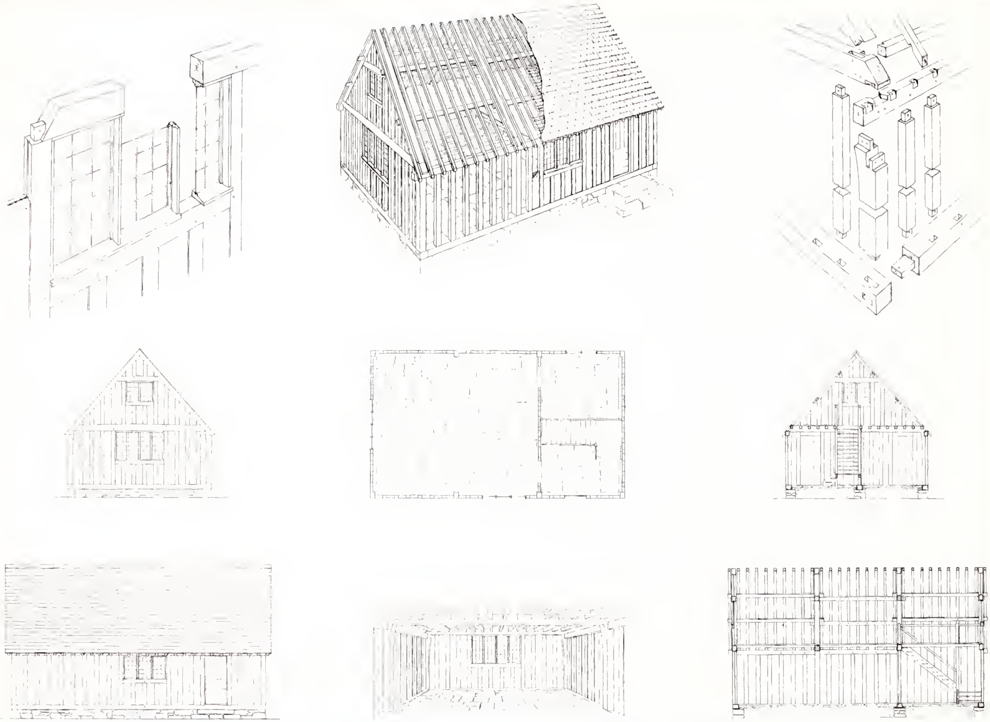


J

(Filippo Brunelleschi, 1420) **D**; the Cathedral, Aix-la-Chapelle (Odo of Metz, c.800) **E**; Church of the Sorbonne, Paris (Lemercier, 1635-1659) **F**, Palazzetto del Sport, Rome (Pier Luigi Nervi, 1960) **G**, American Pavilion at Expo 67, Montreal (Buckminister Fuller, 1967) **H**, and Palazzo del Sport, Rome (Pier Luigi Nervi, 1960) **J**. Ink on strathmore board, second semester.



An example of the study of history within the construction sequence. The structural system of English half-timber construction. Pencil on strathmore board, 30 in. by 40 in., third semester.

SCIENCE-ENGINEERING SEQUENCE

An understanding of science and engineering is essential for architects, not only so they may master the technology of our time, but also to comprehend the significant role these disciplines play in our industrial civilization. A clear grasp of physical principles permits the architect to understand the behavior of structural and mechanical systems, to responsibly judge and select them, and to integrate them with the building as a whole.

The science-engineering sequence begins in the first semester with a course in calculus and analytic geometry. This develops the abstract tools needed to explain physical concepts, and to manipulate them on paper. A later course in computer science develops further methods for solving complex engineering problems.

The study of physics presents to the student such fundamental concepts of nature as space, time, gravity, statics, conservation of energy, thermodynamics, light, color, electricity and atomic structure, all having a profound relevance to architecture.

The engineering portion of the sequence begins with courses in statics and strength of materials, which bring the generalized studies of physics to focus on the behavior of structures, developing in a general way the ideas of force, moments, stress, stiffness, elasticity and deformation. These are followed by a series of three courses in which the students develop the separate engineering treatments of wood, steel and concrete, parallel to their study of the possibilities and limitations of these materials in the construction sequence.

Finally, there is another series of courses, one in mechanical engineering and one in electrical engineering, also in parallel with the construction sequence. The functions and types of various mechanical and electrical systems for buildings are studied in relation to human comfort, energy consumption, capital costs, and their interrelation with other building components.

The aim of the science-engineering sequence is to provide the students with a background of fundamental knowledge to help them evaluate and choose appropriate structural and mechanical systems, which form major parts of the buildings of our age. It also seeks to show how the architect can work in creative interaction with related engineering disciplines in the making of the built environment. Through its clarification of basic physical principles, it further suggests to the student that the structural and mechanical systems that our time has created may be raised above the level of mere technology, and become elements of architectural concepts.

GENERAL EDUCATION PROGRAM

The architecture students also participate in the General Education Program of Illinois Institute of Technology. This program is designed to provide all undergraduates with a basic education in humanities, social sciences and natural sciences. This objective is achieved through a series of approved courses which deal substantively with specific subjects in various disciplines. At the same time, the program provides an opportunity for the student to explore and choose according to their individual interests. The courses are distributed in all five years of the curriculum. The program includes courses in four component categories: Mathematics and Computer Science (three courses), Natural Sciences or Engineering (three courses), Humanities (four courses) and Social Science (four courses).

The course requirements in the first two categories are fulfilled by the Science-Engineering Sequence. The courses of the Humanities component consist of four three-hour courses in English, history, linguistics, philosophy or foreign languages. The Social Science component includes four three-hour courses in anthropology, economics, political science, psychology or sociology. In these two components, two courses must be in the same field, and at least one course must be taken in a second field — a student may not take all four courses in one field or four courses in separate fields.

In addition, the students must also take four additional three-hour elective courses in any field of their choice.

CONSTRUCTION SEQUENCE

The industrial age brought new materials and methods to construction. The use of mass-produced elements has gradually replaced much of traditional craftsmanship in building. It is only natural that these new materials and methods would pose a challenge to architects to master their uses and develop their architectural expression.

However, the great buildings of earlier times, made with traditional materials and techniques, exemplify true values of quality and spirit in building. Their expression often derives from the clear logic of their construction. They set the standard that our construction must meet with the new means of our time.

Providing a building with a sound structure and enclosure against the weather is a basic responsibility of the architect. Therefore, architects must deal with construction directly. One cannot have an arbitrary vision of a building and then attempt to glue it together. Construction by its nature is objective; it is the rational development of a whole time, and a true expression of its spirit. Clear construction can become the basis of architecture itself.

In this sequence, the students learn the possibilities and limitations of construction. They are concerned not only with its quality and durability, but its aesthetic value. They learn not merely how to build, but how to build well.

The studies begin with the materials of construction, how they obey the laws of physics, and how their behavior can be analyzed and manipulated on paper through engineering. Their visual qualities of color and texture are also studied. Next one considers how technology is applied to these materials, how they are fabricated into components and assembled into finished buildings. The industrial age has gradually and objectively developed structural systems for a number of materials. The systems evolved for brick and wood are studied first and then those for steel and concrete, using them to make elementary buildings. Every aspect of these buildings is carefully worked out by the students, using full-size drawings and examining actual materials to bring a sense of reality to the development process. The students analyze and refine the role of every construction element in these systems from three points of view: the physical function of the element, the construction method used in placing it, and its contribution to the building's visual character. The intent of these studies is to clearly understand the material and the system, and to make the architectural expression of the building reflect their spirit.

The sequence presents clear principles of construction, not specific solutions to set problems. If the students can grasp these principles through the examples of the materials and technologies they study; they can apply them to master any new material or technology they may meet in the future.

It is in the construction sequence that the students have their first direct encounter with architectural problems, and that the rational method of the curriculum becomes an integral part of their work. The method emphasizes a process of development, the reasoned unfolding of built form. The word design is avoided, since it often implies arbitrary or whimsical judgement. The application of this method to construction begins with a clear statement of the problem itself. What material and what system are to be used? What physical, technical and visual criteria do this material and system imply? Each part of the elementary building can then be developed by starting from the known facts and proceeding through

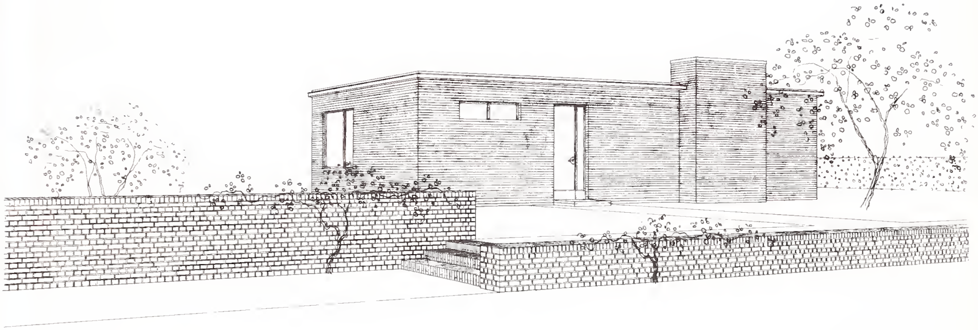
a trial solution, applying the general construction principles that the sequence develops. The trial solution is then criticized in terms of the problem description. Are physical criteria met, such as waterproofness, structural strength and thermal expansion? Are technical criteria such as construction tolerance and ease of fabrication satisfied? Are visual criteria met — does it clearly express the character of materials and system used? The process of trial solution and criticism is repeated, each time improving with added experience, gradually converging to a satisfactory conclusion. The aim is to solve the problem as completely as possible, and to reduce the solution to the simplest possible terms.

In the first course of the construction sequence in the third semester, brick masonry is studied. First the properties of brick and mortar are considered, and their compressive, bearing character established. Then the bonding of walls is investigated, how to terminate walls, to turn corners and make intersections with them, all within the discipline imposed by the bonding system. The walls developed in the bonding studies are then used to begin to make a simple building. A roof is added to the bearing walls, introducing the problems of beams, slabs and waterproofing. Next, openings are cut in the walls, and doors and windows developed. Then foundations and a chimney are studied. Finally interior partitions and cabinet work are added. All the parts of the building are studied with full-size drawings and the actual materials whenever practical, always relating them to the whole. The project is then summarized in a set of drawings on illustration board, showing key full-size details and overall views in plan, section and perspective. The aim is to produce a building illustrating clear construction in brick, one whose architectural expression grows out of the nature of the material itself.

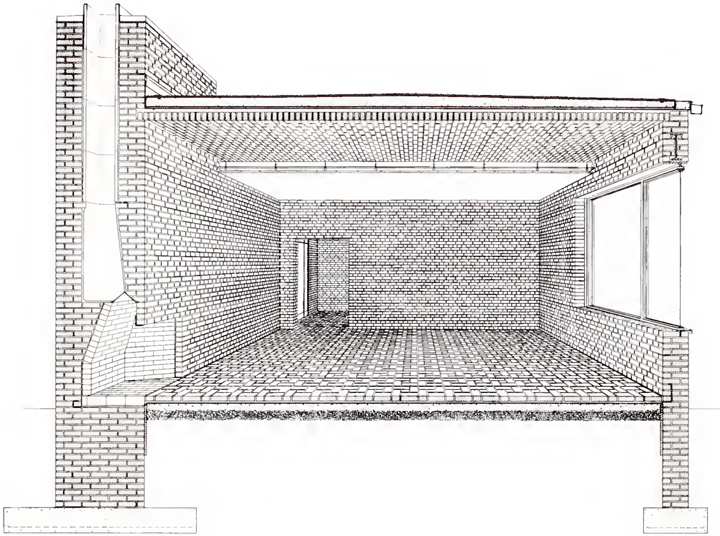
Construction in wood and stone is the subject of the fourth semester. As with brick, the properties and character of wood are studied first. The different types of trees from which wood is derived, its microscopic structure, and how it behaves under different stress and moisture conditions are investigated. The cutting, shaping and various methods of joining wood are discussed. Concurrently stone is also studied; the properties and uses of sedimentary, metamorphic and igneous rock are introduced. The various structural systems using wood are then presented, starting with heavy timber and extending to the light balloon frame. One of these systems is then developed in an elementary building, in combination with stone foundation walls. Again, roof and walls, doors and windows are evolved through full-size drawings and the study of actual materials, carefully integrating them with the overall building concept. The resulting building seeks to demonstrate the character of wood and stone through the clarity and quality of its construction. Gradually the students perceive how architecture begins to emerge from the facts of construction itself.

Steel and concrete are introduced in the fifth semester's work. As with wood and brick, the properties of the materials are discussed first. Their chemical composition, elastic behavior, ultimate strength, manufacture, shaping, quality control and other important attributes are described. Simple structural systems using them are studied next. The basic idea of the structural skeleton composed of beams, girders and columns is explored. Then the systems are applied to small buildings; as before, all their elements are developed, not only with drawings but also with the use of models. The final presentation usually includes both drawings and a finished model. As with the traditional materials studied previously, the unique characteristics of steel and concrete form the basis of architectural expression in these problems.

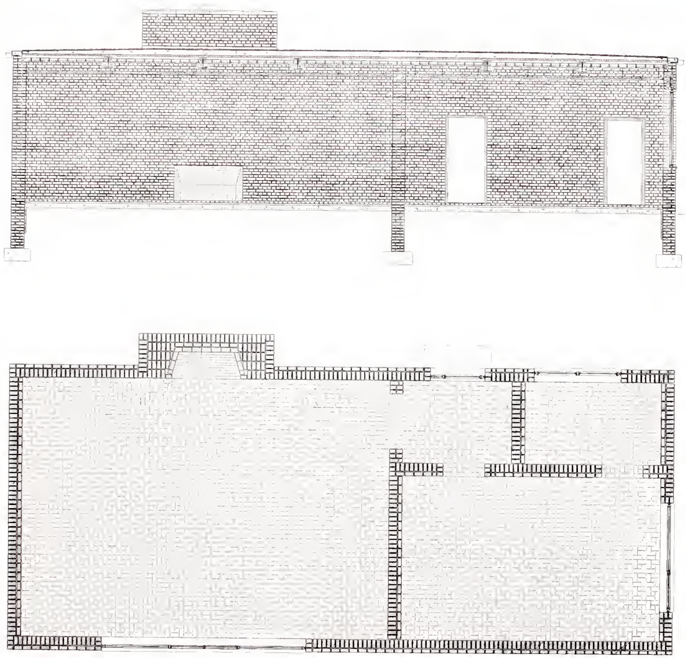
The sixth semester explores larger-scale structures in steel and concrete. The skeleton is extended upward to form high-rise towers, introducing the problem of lateral bracing against wind and seismic forces. The hierarchy of long-span structures is also studied. The overlapping ranges of different structural types are developed, starting with simple beams and continuing through rigid frames, plate girders, trusses, vaults, two-way grids, spaceframes, domes and suspension systems. Models are an important tool in these studies, supplementing drawings throughout. The remarkable range of structural types evolved by our industrial age presents the student with manifold possibilities for future development.



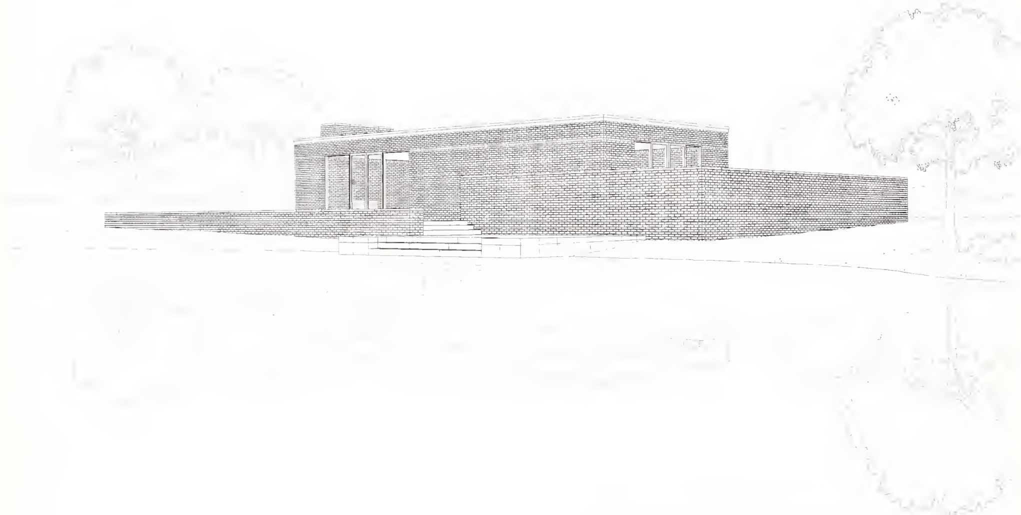
Brick bearing wall house, exterior perspective view with garden walls. Pencil on strathmore board, 20 in. by 30 in., third semester.



Brick bearing wall house; transverse section through chimney with interior perspective view. Reinforced brick roof slabs are supported by steel beams resting on 12 in. English cross-bond walls. Pencil on strathmore board, 30 in. by 40 in., third semester.

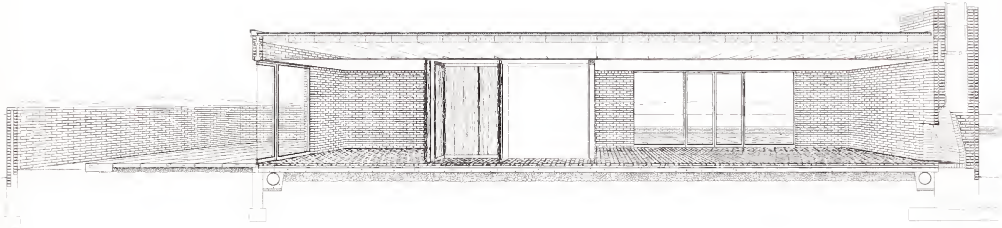


Brick bearing wall house, longitudinal section and plan. Pencil on strathmore board, 30 in. by 40 in., third semester.

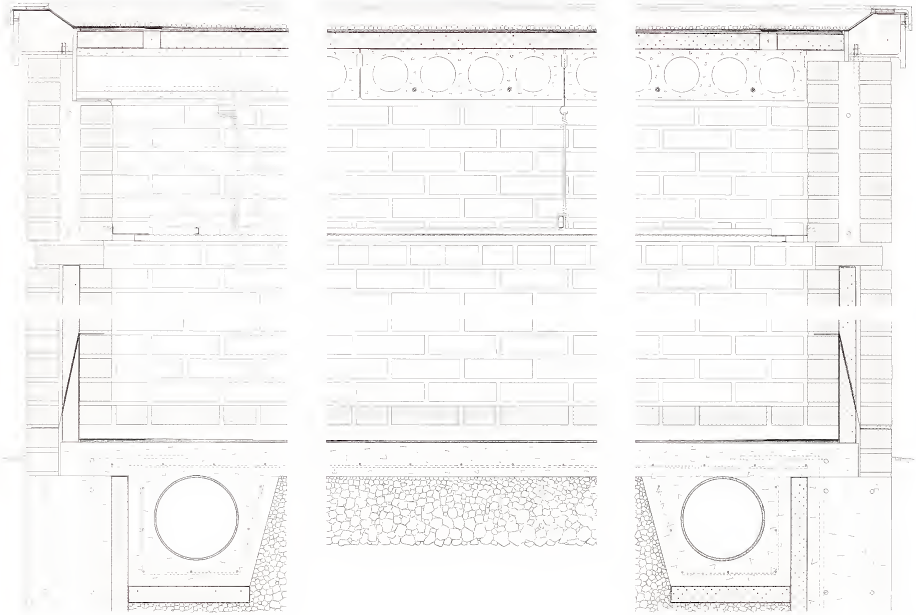


Weekend house in brick on a lake; exterior perspective view. Pencil on strathmore board, 30 in. by 40 in., third semester.

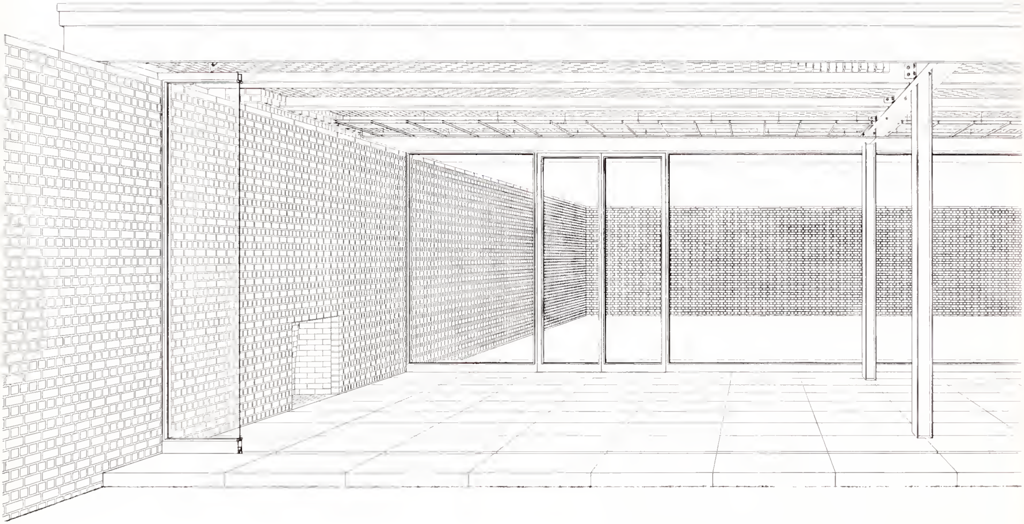
Weekend house in brick, plan showing garden court and lakeside terraces with waterstair Pencil on strathmore board, 30 in. by 40 in., third semester.



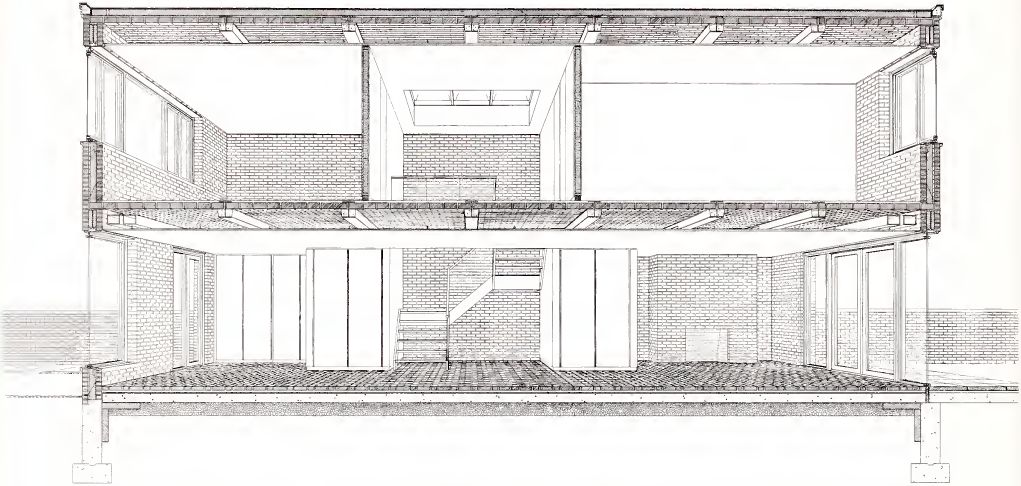
Weekend house in brick; longitudinal section through garden court with perspective view. Hollow precast concrete roof slabs are supported on a reinforced brick perimeter beam which rests on 10 in. brick cavity walls. Pencil on strathmore board, 30 in. by 40 in., third semester.



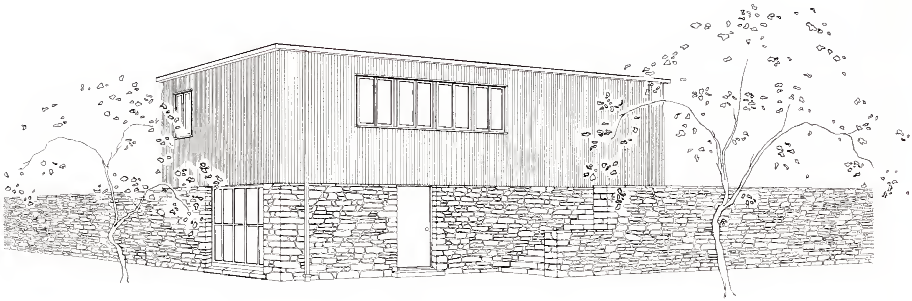
Weekend house in brick; roof and floor slab details. Heating is provided by a perimeter duct under the floor slab. Pencil on strathmore board, 30 in. by 40 in., third semester.



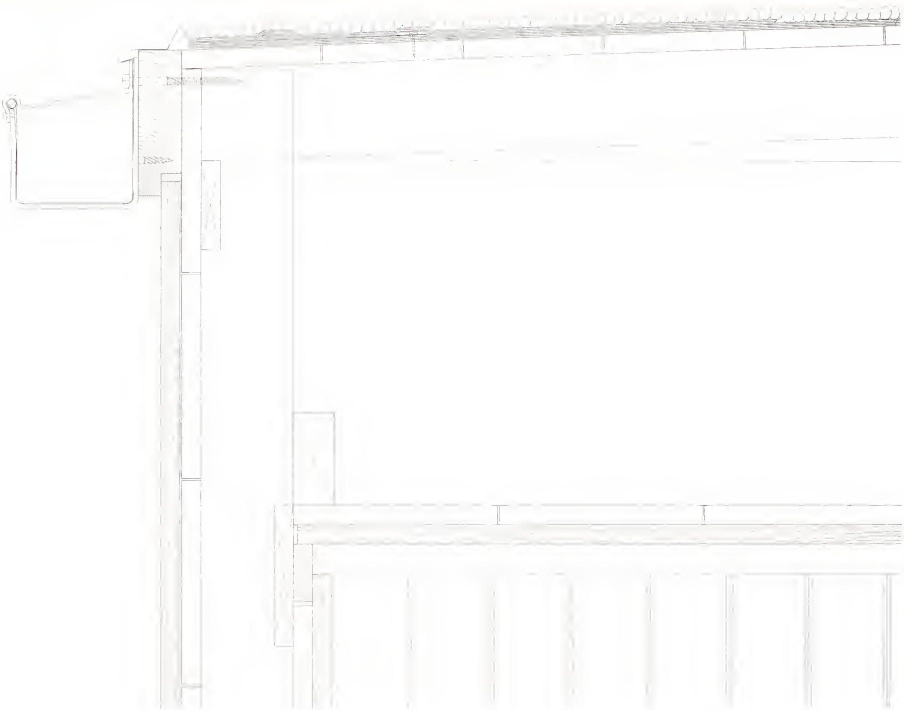
House with two courts in brick; partial perspective view. Reinforced brick roof slabs are supported on steel beams which rest on interior steel columns and 16 in. English bond court walls. Pencil on strathmore board, 30 in. by 40 in., third semester.



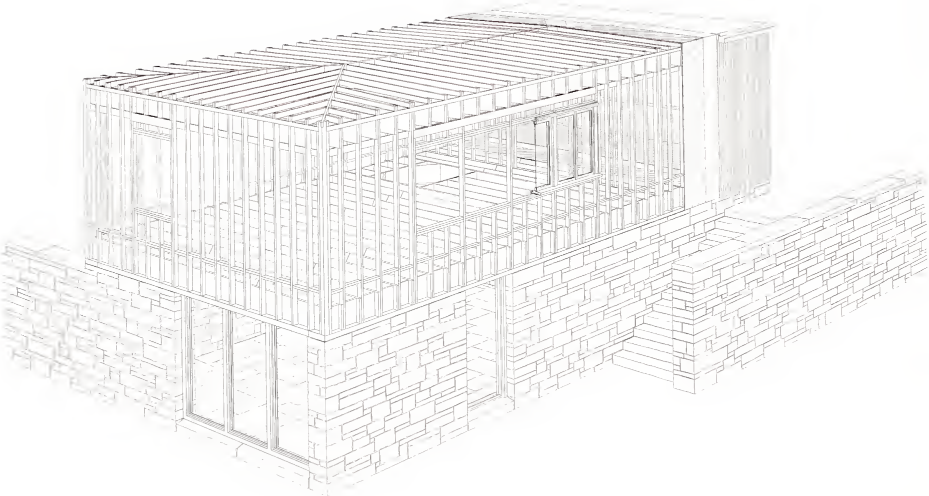
Two-story row house in brick; longitudinal section with interior perspective view. Reinforced brick roof and floor slabs are supported on steel beams resting on 12 in. reinforced brick bearing walls. Exterior is enclosed with 12 in. brick cavity walls. Pencil on strathmore board, 30 in. by 40 in., third semester.



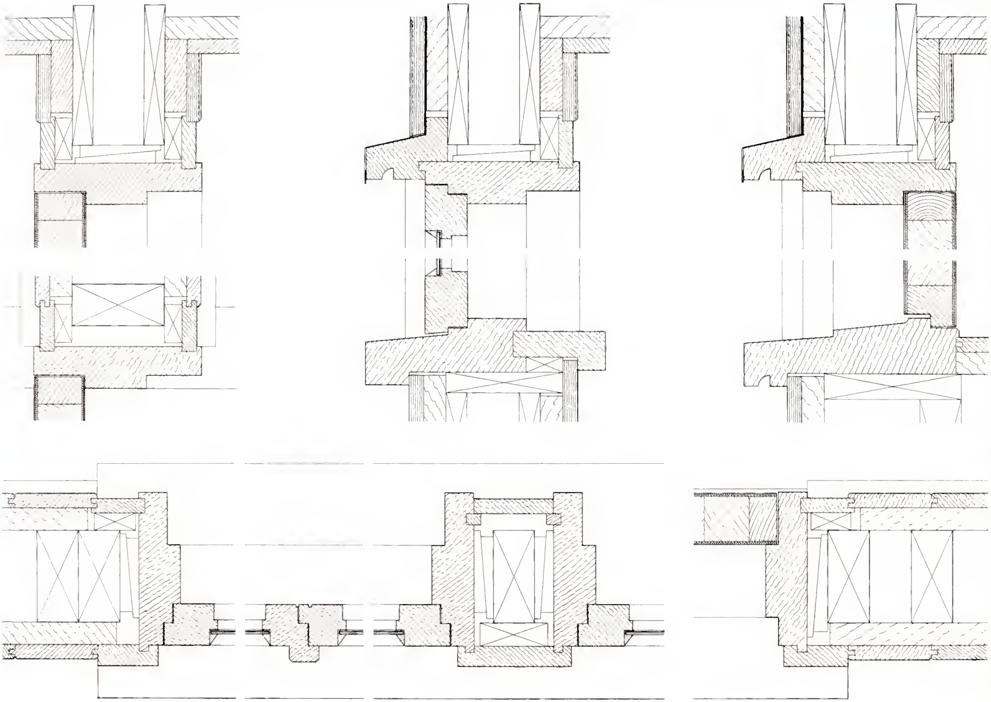
Two-level house in wood and stone on a sloping site; exterior perspective view. Pencil on strathmore board, 20 in. by 30 in., fourth semester.



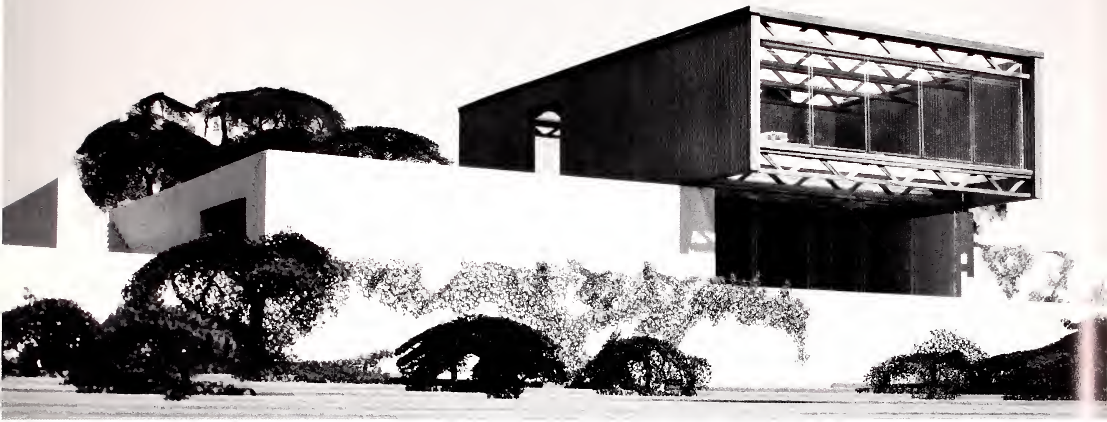
Two-level house in wood and stone; roof detail. Hip roof drains to a copper gutter. Balloon frame construction is enclosed with natural wood siding on both interior and exterior surfaces. Pencil on strathmore board. 30 in. by 40 in., fourth semester.



Two-level house in wood and stone; exterior perspective view showing framing. Balloon frame is supported on 18 in. stone walls. Pencil on strathmore board, 30 in. by 40 in., fourth semester.



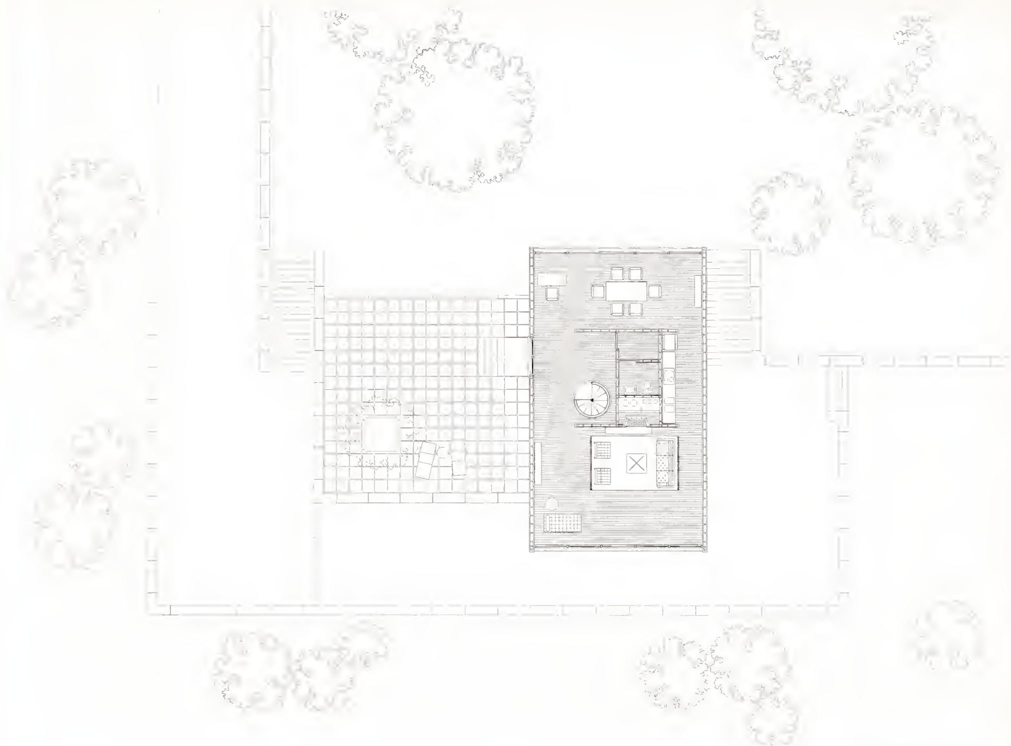
Two level house in wood and stone; door and window details in wood. Pencil on strathmore board, 30 in. by 40 in., fourth semester.



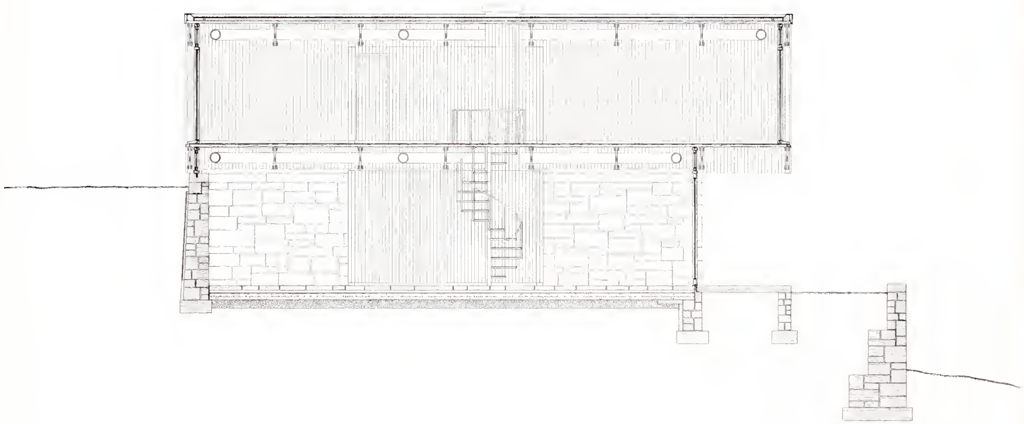
A

B

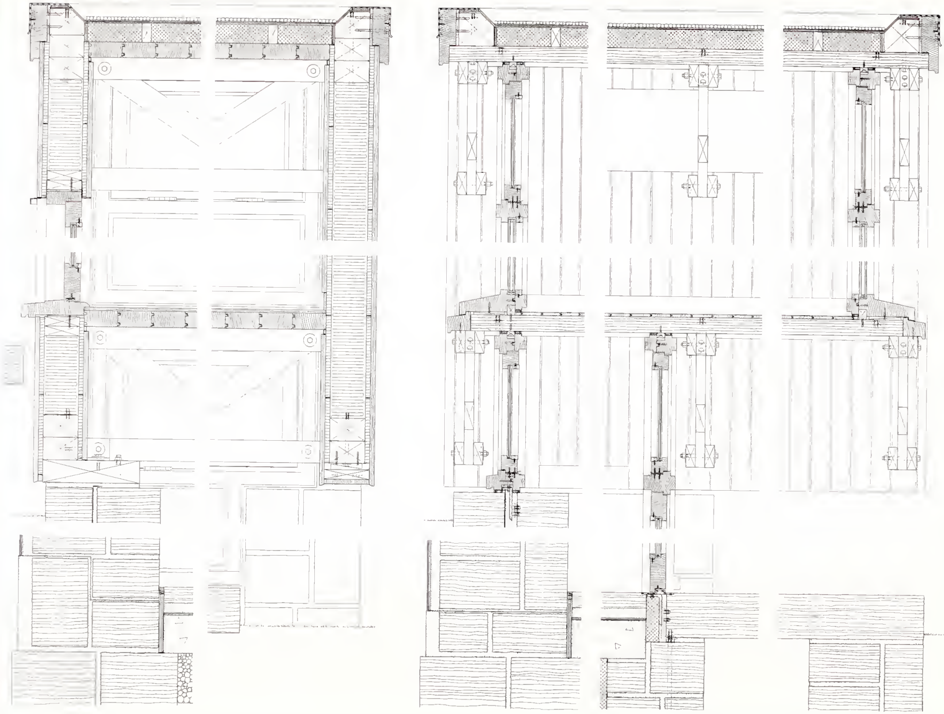
Country house in wood and stone on a hillside. View of upper living level with light wood roof and floor trusses spanning between balloon frame walls, which are cantilevered from stone retaining walls; the bedroom level beneath opens on to the lower level terrace **A**. View showing garage entrance and stone stairway leading to upper level terrace; both upper living level and lower bedroom level overlook the valley below **B**. Photographs of model, fourth semester.



Country house in wood and stone; upper level plan showing terraces and connecting stairways. Pencil on strathmore board, 30 in. by 40 in., fourth semester.

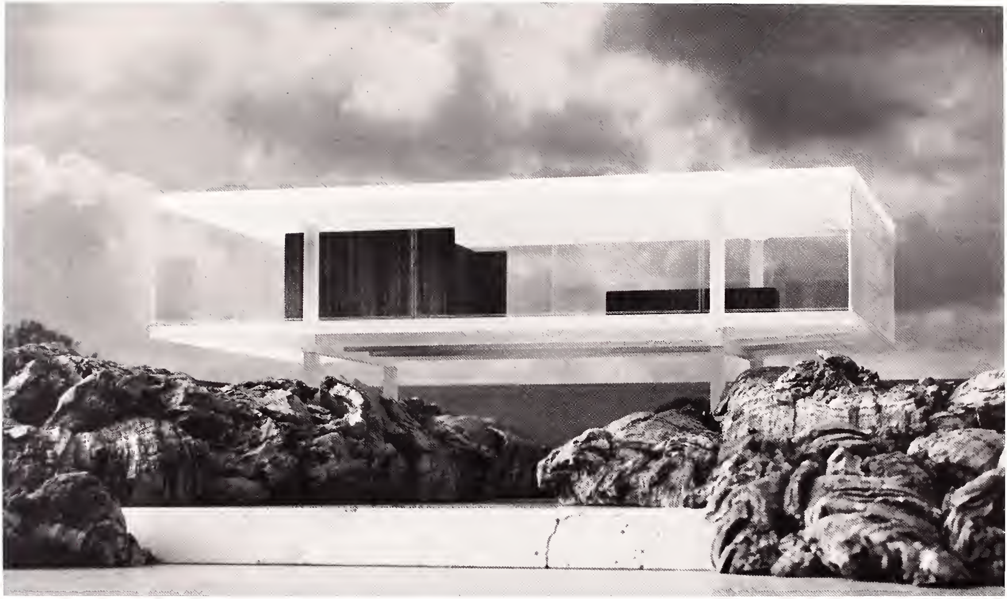


Country house in wood and stone; longitudinal section. Clerestory windows light sleeping area at interior of lower level; exposed tubular ductwork running through trusses distributes conditioned air. Pencil on strathmore board, 30 in. by 40 in., fourth semester.



Country house in wood and stone; vertical sections showing roof, floor and window details. Wood trusses are fabricated from 2 in. by 4 in. members; walls are framed with 2 in. by 6 in. studs; openings are double-glazed with clerestory hopper windows for natural ventilation. Pencil on strathmore board, 30 in. by 40 in., fourth semester.

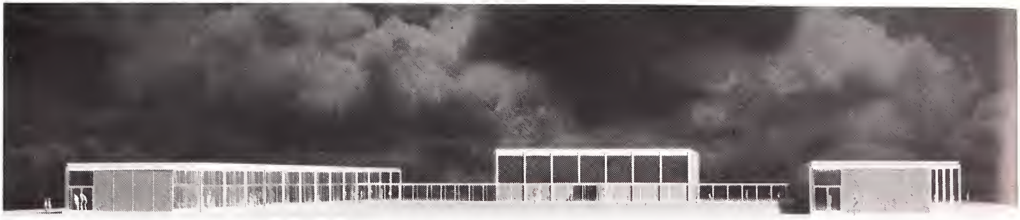
Vacation house in steel over a ravine. Cantilever fascia girders resting on columns 33 ft. apart support roof and floor beams. Photograph of model, fifth semester.



Vacation house in concrete over a ravine. Roof and floor slabs rest on beams and girders, which cantilever in two directions from interior columns. Photograph of model, fifth semester

Vacation house in steel over a ravine Roof and floor are supported by steel beams, which are carried on full-height trusses with tension rod diagonals. Photograph of model, fifth semester.

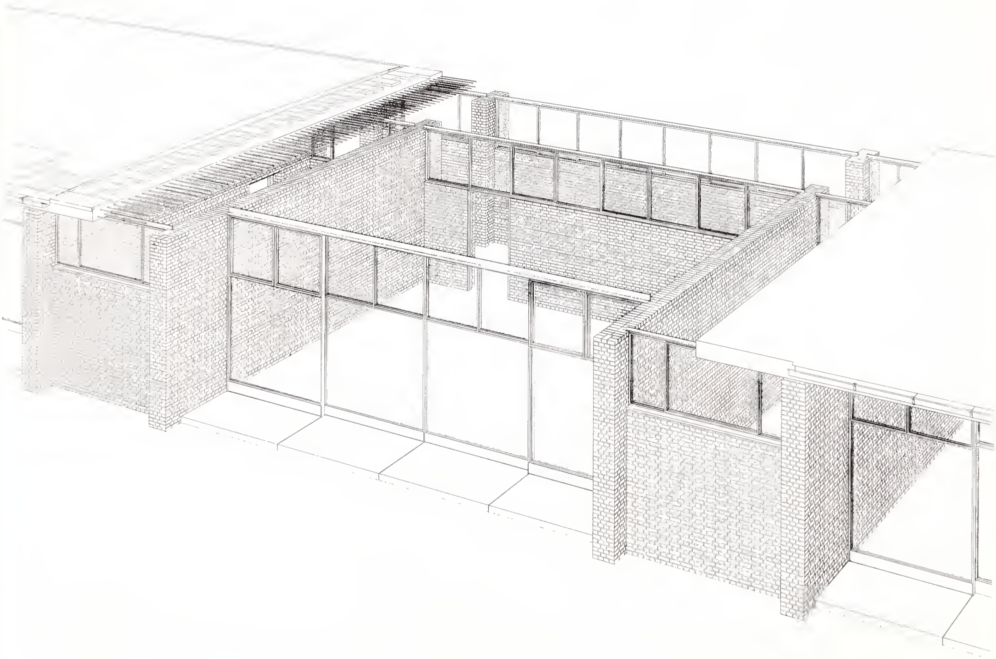
Vacation house in aluminum over a ravine. Roof and floor consist of stressed-skin panels cantilevered from cruciform columns. Photograph of model, fifth semester.



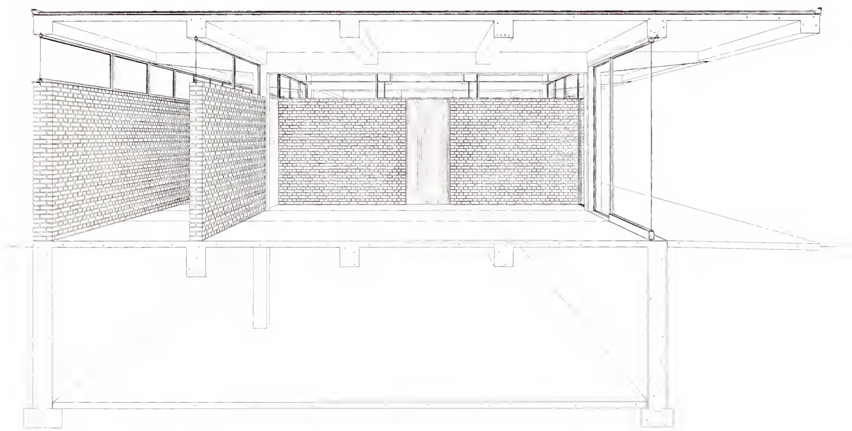
A

B

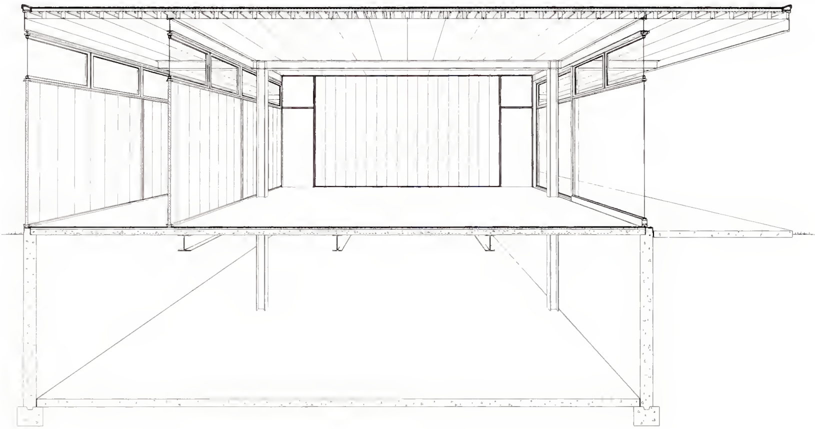
Elementary school in steel. View of courtyard between classroom wings with multipurpose room in background, a glass-enclosed corridor links the three elements **A** View of multi-purpose room with two-way steel grid roof supported on perimeter columns **B** Photographs of model, sixth semester.



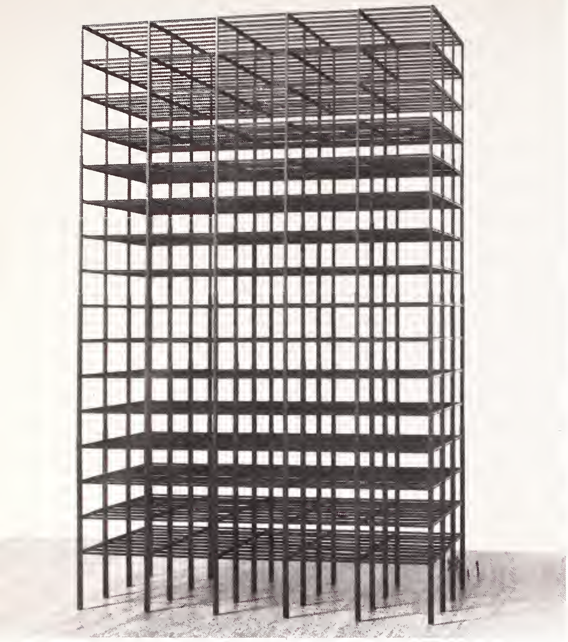
Elementary school classroom wing in brick and concrete, perspective view showing construction elements. One-way concrete roof slab is supported on 16 in. english bond cross walls; the south wall of the typical classroom has full-height rolling glass doors; a corridor lighted by clerestory windows extends along the north wall. Pencil on strathmore board, 30 in. by 40 in., sixth semester.



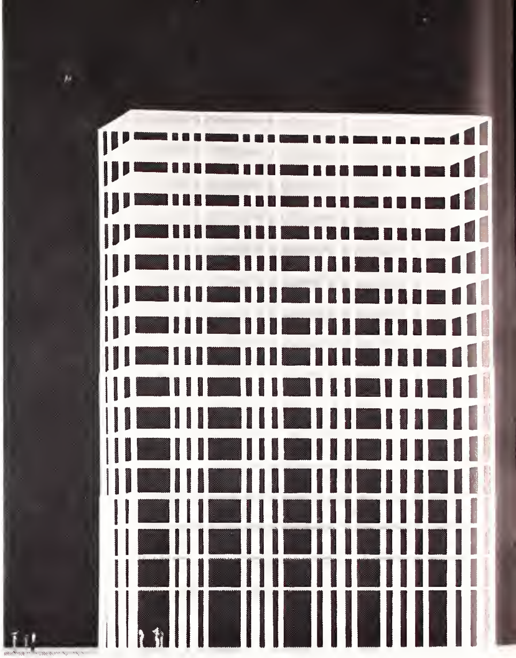
Elementary school classroom wing in concrete; transverse section with perspective view. Beams spanning 24 ft. are supported on cantilever girders carried on columns 24 ft. apart; enclosure consists of glass and brick walls. Pencil on strathmore board, 30 in. by 40 in., sixth semester.



Elementary school classroom wing in steel; transverse section with interior perspective view. Deep metal roof deck spanning 24 ft. is supported by cantilevered beams carried on columns 24 ft. apart; enclosure consists of glass and insulated metal wall panels. Pencil on strathmore board, 30 in. by 40 in., sixth semester.



A

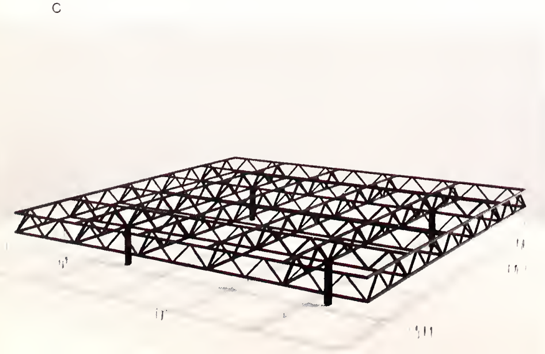


B

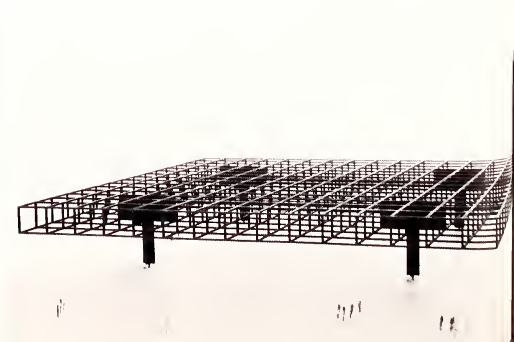
Steel skeleton construction. 16-story structure with 24 ft. square bays **A**. Concrete skeleton construction. 16-story structure with flat slab floors supported by columns 24 ft. apart **B**. Photographs of models, sixth semester.

Long-span steel structure. 225 ft. square roof supported by two-way warren trusses at 45 ft. centers, cantilevered from four interior columns **C**. Long-span steel structure. 225 ft. square roof supported by two-way vierendeel trusses at 15 ft. centers, cantilevered from four interior columns **D**. Photographs of models, sixth semester.

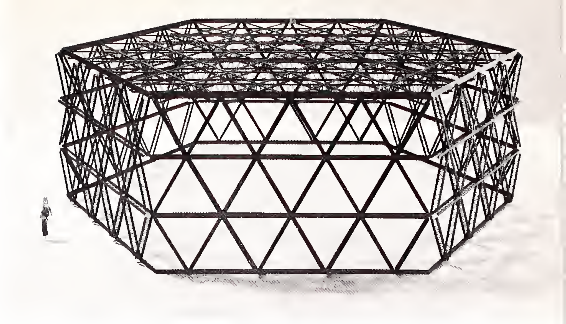
C



D



The structures of various magnitudes shown in the photographs of models on these and the following three pages were developed under the direction of Professor Alfred Caldwell in his third-year construction course. Professor Caldwell taught these and other construction classes for over fifteen years with great understanding and intensity



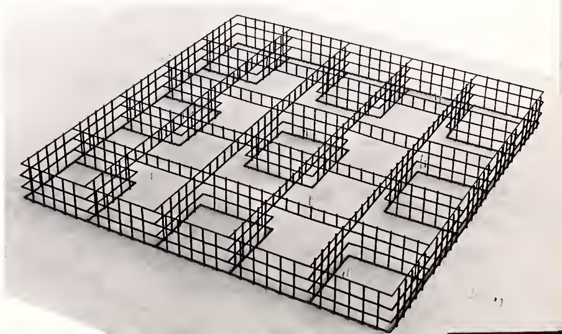
A

Steel skeleton construction. Hexagonal structure 32 ft. on each side with walls and roof made up of steel bar joists **A**. Photograph of model, sixth semester.

B

Steel skeleton construction. 40 ft. square roof supported by two-way steel beams at 8 ft. centers, each carried by a perimeter column **B**. Photograph of model, sixth semester.

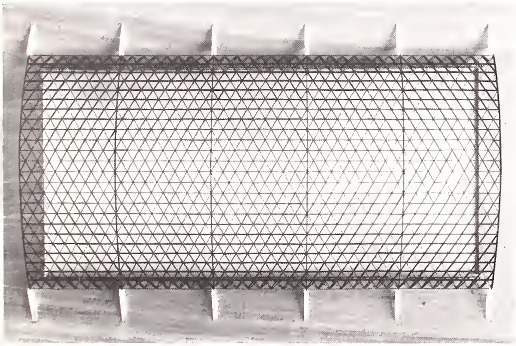
C



Steel skeleton construction. A group of nine 40 ft. square units shown in B are joined together by 40 ft. vierendeel trusses to form a 200 ft. square structure **C**. Photograph of model, sixth semester.

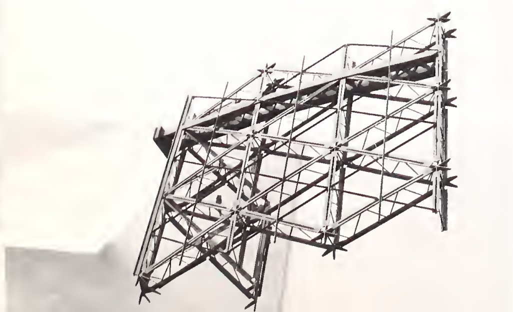
A

B



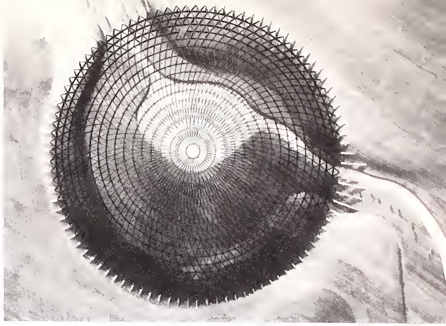
Long-span steel structure. Triangular grid barrel vault spanning 300 ft. supported by concrete piers; grid members are trusses bolted together with forged steel connectors. Ground level view **A** plan view **B**, structural detail **C**. Photographs of models, sixth semester.

C



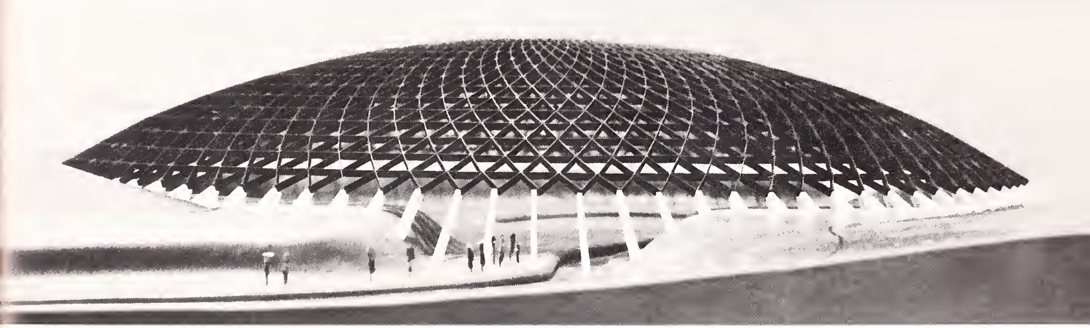
Long-span steel structure. Triangular network of catenary cables forming a hexagon, supported by vertical stay cables carried over inclined struts **F**. Photograph of model, sixth semester.

Long-span steel stucture for zoo aviary. Triangular grid dome supported by radial concrete piers, grid members are trusses bolted together with forged steel connectors. Plan view **D**, ground level view showing entrance **E**. Photographs of model, sixth semester.

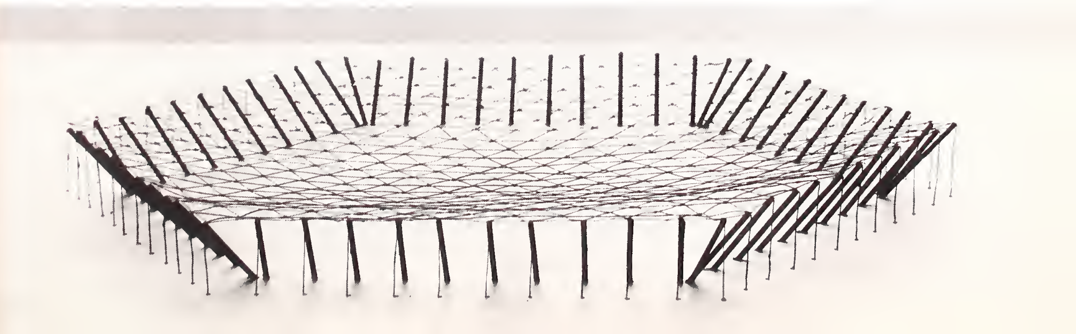


D

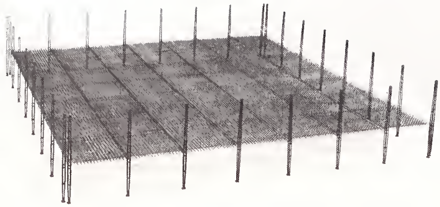
E



F



Long-span steel structure. Two-way grids of pratt trusses are hung from catenary cables spaced 285 ft. apart, forming a clear-span roof 2000 ft. square; the cables are supported on masts 480 ft. high. Overall view **A**, detail view of corner **B** Photographs of model, sixth semester.



A

B

PLANNING SEQUENCE

Most buildings are constructed to serve a function. Each age determines the functions of its buildings according to its interpretations of human and social needs. Planning is the aspect of architecture that analyzes and understands those needs, and shapes the building to meet them. But functional considerations have a wide range of application in the built environment. They begin with the arrangement of furniture in a simple room and extend upward in scale to buildings and building groups, to neighborhoods and cities, and finally to regions. Although the architect is usually concerned with a single building or possibly a group, a knowledge of city and regional planning is also vital to him, for it gives an understanding of the larger physical context in which his work is embedded.

The planning sequence of the curriculum was developed by Professor Ludwig Hilberseimer, who had been Director of the Department of City Planning at the Bauhaus, and who came to Armour with Mies in 1938. Hilberseimer shared Mies' rational approach to architecture and planning, based on the development of clear principles. He also shared Mies' exemplary view of history; the great planning works of the past should serve as an inspiration to us to realize results of similar quality with the means of our own time.

Hilberseimer's concern in planning was the development of principles that could bring order and harmony to the functions of the buildings, cities and regions of our industrial age. He perceived that the industrial world had created certain conflicts with the natural world, and he sought to reconcile them through the planning process. He wrote:

> Planning is an application of principles. Principles, which grow out of the order of things, lead to a method and theory of planning, based on an investigation of facts and requirements as well as on a concept of life. Following such a principle-based theory, we can develop each part of a city or a region according to its function and we can also determine for each part of our plan its rightful place in the whole.(1)

Concerning his interest in the integration of the works of man with the patterns of nature, he wrote:

> Man may act according to the laws of nature, in harmony with them, or against them. . . When man obeys the laws of nature, he will find abundance; when he disobeys them, he will meet want and poverty.(2)

Some of the planning principles that Hilberseimer developed were these. Winter sunlight should be required in every room of a dwelling. It not only offers space heating and physical and psychological benefit for the occupants, but it also becomes a means of controlling population density by limiting the spacing of dwellings to permit sun penetration. All the inhabitants of a city should be within easy walking distance of schools, industrial work places, shopping and natural parks for recreation. This will re-integrate the segregated functions of the giant industrial city into settlement units of human scale. It will also reduce dependence on mechanical transportation and traffic congestion. The landscape should penetrate the city everywhere, providing pleasant traffic-free walkways for the pedestrian and natural recreation areas. It will also allow the city dweller to practice small-scale agriculture, and enrich the quality of urban life with the visual enjoyment of nature. Regions should be developed through the careful use of natural resources and the preservation of ecological balance. This can permit balanced development of

agriculture and industry, providing an economically stable diversity of employment in farms, workshops and factories. It will also maintain the visual quality of the cultivated and natural landscapes.

The planning sequence involves the study of function and the development of principles at successively increasing scales, applying the knowledge developed at each level to the next. The studies begin with single rooms and extend upward to dwellings, community buildings, settlement units, cities and regions. At all levels the problems are approached by the rational method introduced in the construction sequence; first a clear statement of the problem, then the application of principles through a number of trial solutions which gradually converge to a satisfactory result.

The first course in the planning sequence is concerned with housing and community buildings. The students start with the investigation of single-function rooms, the smallest planning element for human use. Minimum and optimum solutions are developed for such spaces as bedrooms, bathrooms and kitchens. The room studies are then used for the development of dwellings. Detached houses are studied first, starting with minimum versions, and proceeding to optimums. Consideration is given to the functional arrangement of rooms, circulation patterns, and integration of plan with structure. Winter sunlight is provided in all major spaces, and summer cooling helped by planting, overhangs and natural cross-ventilation. The organic relationship of the house to its site is also developed, opening it to landscaped spaces for recreation and productive gardens. Other dwelling forms such as rowhouses, walk-up apartments and high-rise towers are developed by the same principles. Then simple community buildings such as schools and commercial and industrial buildings are studied. Finally all these building types are combined to form a settlement unit, a planning element developed by Hilberseimer to function as a self-contained community with housing, schools, recreation, commercial facilities and industry, lacking only those services that must be provided at larger urban and regional scales. The overall size of the unit is determined by easy walking distances, introducing a human scale to its visual and social dimensions. The circulation network separates pedestrians and vehicles in an interlocking finger pattern. The community is surrounded and penetrated by the landscape, providing parks for recreation and gardens, and a visually pleasant environment for its inhabitants.

The second course in the planning sequence in the seventh and eighth semesters considers city planning. The historical development of cities in the past, and the economic and social forces that shaped them are studied. Then the industrial cities of our time are reviewed; their basic elements and the conflicts they have created are analyzed. A number of planning studies are then made, each based on a particular urban problem. These studies lead to the organic development of the city based on aggregates of settlement units, carefully ordering all its functional elements, and integrating the urban fabric with the countryside. Then the principles which have been developed are applied to the re-planning of an actual city. Extensive information is gathered and analyzed to form a basis for planning decisions. Then several possible schemes are made for the city's renewal and future development.

As an option in the fifth year, students may take two semesters of work in regional planning in place of the last two semesters of the architecture sequence. The course begins with the definition of a region as a self-contained organic unit, based on natural features. The development of regional planning policies is explored in a series of exercises and discussions, with particular emphasis on increased self-sufficiency, diversity of employment for economic stability and preservation of ecological balance. After these introductory studies, an actual region is chosen for redevelopment. First a detailed survey is made to describe and analyze the region's population, topography, soils, climate, natural resources, existing infrastructure, and historical growth, with these data being recorded in drawings and reports. Then a set of appropriate planning policies is formulated, and a new regional plan developed to implement them.

THE SETTLEMENT UNIT

Professor Ludwig Hilberseimer (From *The Human Environment: The Development of a Planning Idea*, 1963)

The structure of this unit offers a general solution for all the different parts of the city, and their relation to each other. It allows a free and unhindered growth, and provides a framework for a healthy community life, and contains all the essentials for it. The problem was to develop in such a unit residential, working and recreational areas, according to their functions; to give each its proper place, to relate them to each other and to the whole in such a way that no area has an adverse influence on another. To avoid local traffic as much as possible, the areas are within walking distance of each other. The shape of the unit is a rectangle of such proportions that it reduces to a minimum the street area required. Its street system is differentiated according to function, from the lanes which connect the houses with the streets to the local and main highways. Each house can be reached by car, and by making all residential streets closed-end streets(1), through traffic within the residential area is avoided.

On one side of the local traffic artery lies the industrial area; on the other are the commercial and administration buildings within a green belt. Then follows the residential area, surrounded by a park. In this park are schools, playgrounds, and other community buildings. The park can be reached without crossing a traffic street. Gardens and farms, meadows and forest adjoin the park area, which connects the unit with the open countryside.

The population of such a unit is determined by the kind of work to be performed, industrial as well as clerical. There are, however, other considerations which will influence the size of the population. The unit should be large enough to meet the social and personal requirements of the individual, to provide variety in work and life, and to be able to support the necessary commercial, cultural and hygienic institutions. The population should, at the same time, be small enough to preserve an organic community life, so that democracy could prevail, and each individual participate in community activities. Consequently, the density within such a unit may vary, but in general it should be as low as possible.

The buildings within the unit are varied and could be of great diversity. There are family houses of different sizes, as well as apartment buildings. The houses have vegetable gardens. To secure the proper orientation for the dwellings, the units themselves could be located at the proper angle, and the streets arranged accordingly, or better still, the lanes leading from the houses to the streets. If necessary, each house could have its own garage. If this is the case, then pedestrian walks, which do not cross traffic streets, should be provided, in order to give safe access to the park. Another solution would be to have community or group garages.

The settlement units we proposed as well as their manifold derivations, are flexible in themselves. They can meet any requirement which arises, and are adaptable to any topographical feature. No matter how many units are combined, the favorable conditions within each unit would always remain the same. The schools in the units gain a new significance. They become small community centers. Their auditoriums are available for meetings, concerts, and plays, their libraries may offer books for adults as well as for children, while their halls provide space for exhibitions and social gatherings.

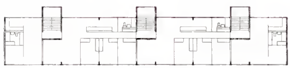
Units can be combined into rows along a traffic artery. The industries located opposite the residential area, close to the traffic artery, could be expanded if necessary. If no expansion is required, then the industries and their respective residential areas could be placed on both sides of the traffic artery. The

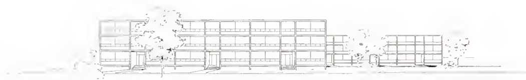
second row of units could also be replaced by units of small farms for part-time workers in these industries. Units could also be combined into communities — larger and smaller ones — all would provide working areas with space for industry and commerce, as well as space for parking. The units also offer the opportunity for expansion of these communities. If necessary, new units could be added to the existing ones, or new communities could be formed, which could begin with a single unit.

1. Closed-end streets and the particular tree-like pattern of the street system go back to ancient times. Selinus, a Greek city in Sicily, and Corcula, a medieval city in Dalmatia are based on this tree-like pattern. It was introduced into contemporary planning by Raymond Unwin for a small housing project, and first used at Radburn, New Jersey by Clarence Stein and Henry Wright. In projects by Frank Lloyd Wright, Hans Ludwig Sierks and Peter Friedrich it was also used. Because it is economical it is used more and more.

Room studies. Horizontal sections with interior perspective view showing variations in the size of master bedroom suites. Ink on strathmore board, 20 in. by 30 in., fifth semester.

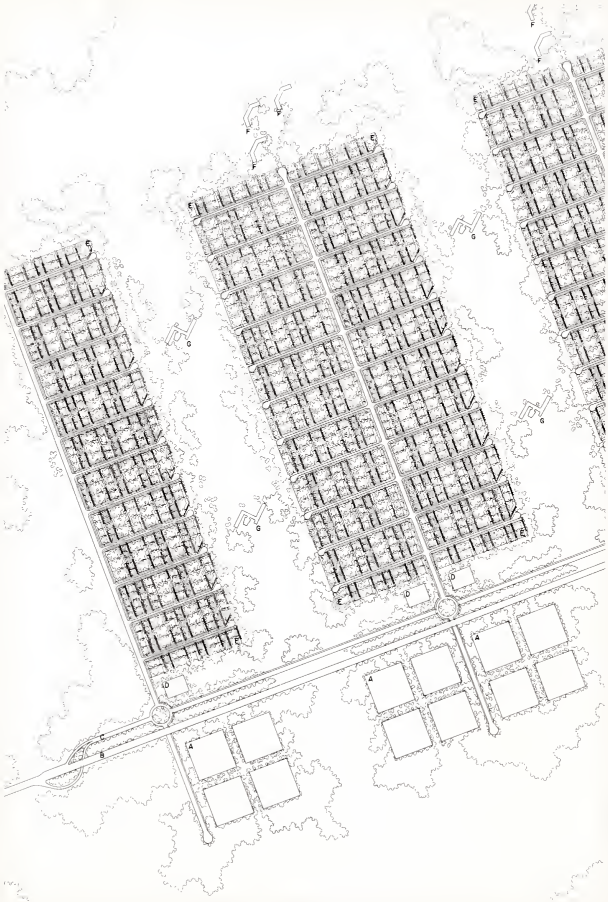
Dwelling studies. Plans showing the effect of varying proportion on a single-family dwelling of given floor area. Ink and pencil on strathmore board, 20 in. by 30 in., fifth semester.





Dwelling studies. Plans and perspective view of a three-story walk-up apartment building with efficiency, one-, two-, and three-bedroom units. Ink on strathmore board, 20 in. by 30 in., fifth semester.

Density studies. Site plan showing placement of single-family houses at a density of six dwelling units per acre, with separation of pedestrian and vehicle circulation and integration with the landscape. Ink on illustration board, 20 in. by 30 in., fifth semester.

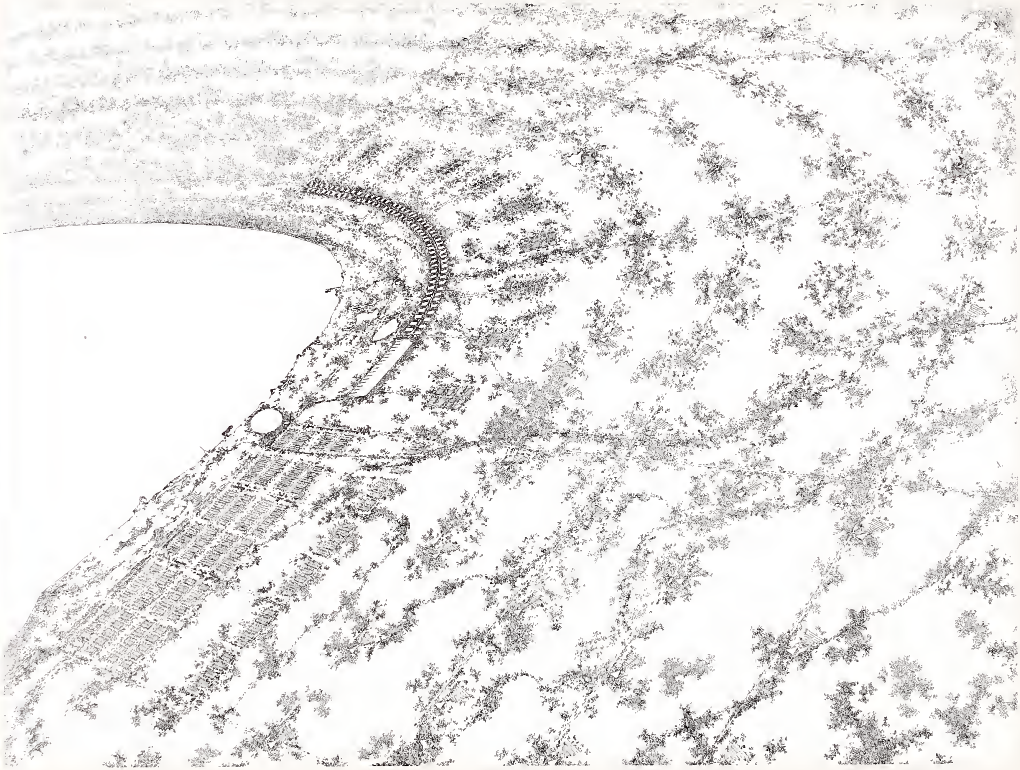


Settlement unit. Plan showing integration of functional elements for increased self-sufficiency, separation of pedestrian and vehicular traffic, penetration of the city by the landscape. A: industry, B: limited access highway, C: local highway, D: commercial center, E: single-family dwellings, F: high-rise apartments, G: schools. Ink on strathmore board, 30 in. by 40 in.

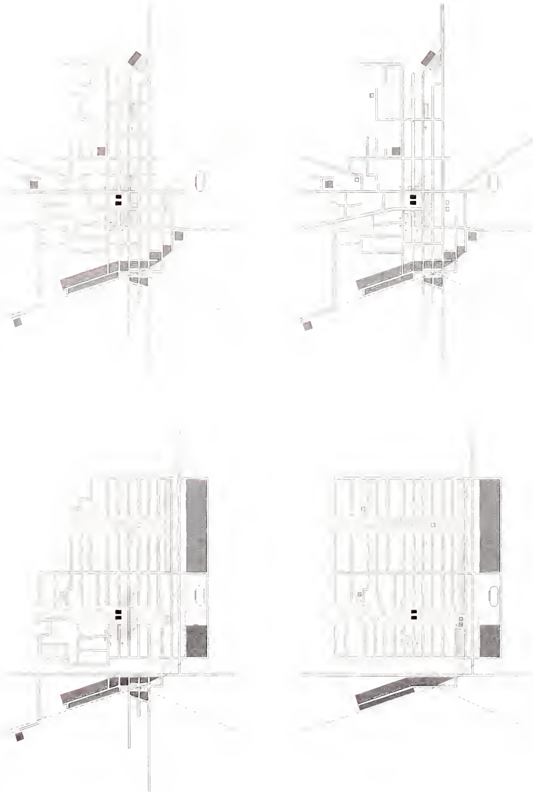
A

Settlement units, placed along a river View showing roads along ridges, landscaped pedestrian walks in ravines and schools in a park at the river's edge. Photograph of model **A**, sixth semester. Settlement units, near a lake. View showing widely spaced high-rise apartments located in a park on the lakeshore, with other elements placed further inland. Photograph of model **B**, eighth semester.

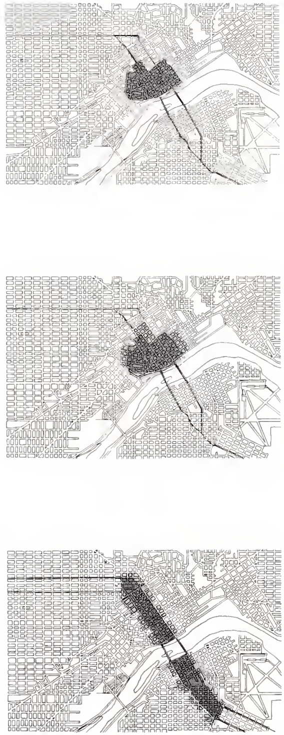
B



Aggregates of settlement units. Aerial perspective view of a proposed replanning of Chicago based on groups of settlement units dispersed in the landscape. Ink on illustration board, 30 in. by 40 in.

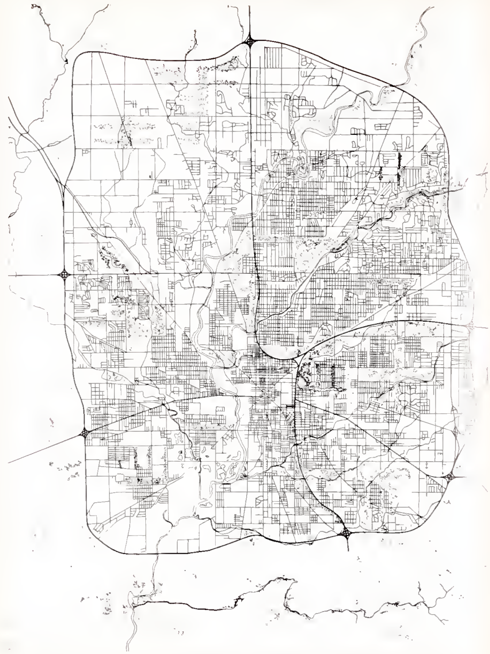


Replanning of existing cities. Plans of possible stages in the replanning of Elkhorn, Wisconsin on the principles of the settlement unit. Ink and printed tone film on strathmore board, 20 in. by 30 in., seventh semester.



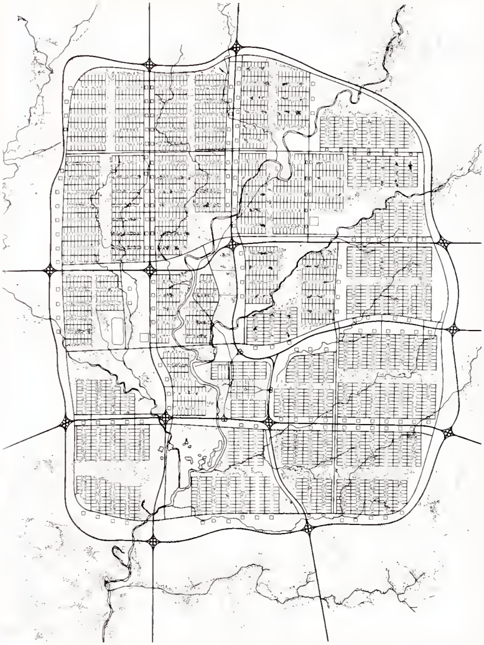
Replanning of existing cities. Plans of the central area of St. Paul, Minnesota showing top: existing commercial area (dark tone), middle: provision of new parking area (light tone), bottom: possible linear replanning of commercial and parking areas. Ink and printed tone film on strathmore board, 20 in. by 30 in., seventh semester.

A

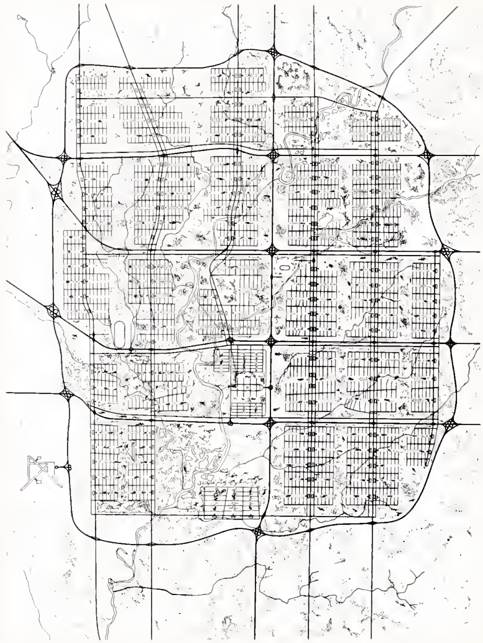


B

Replanning of existing cities. Plans of Indianapolis, Indiana showing three stages in the city's historical development **A** and possible first stage of redevelopment **B**. Ink on strathmore board, 30 in. by 40 in., eighth semester.



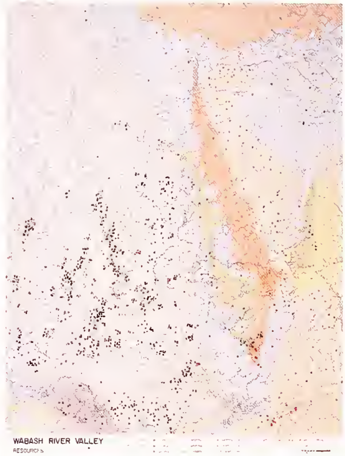
A



B

Replanning of existing cities. Plans of Indianapolis, Indiana showing two possible end stages of the redevelopment process **A** and **B**. Ink on strathmore board, 30 in. by 40 in., eighth semester.

A



B

C

D

Regional planning. Redevelopment of the Wabash River Valley. Part of a series of maps forming a survey of existing environmental conditions including Topography **A**, Resources **B**, Soils **C**, and Occupations **D**. Ink and airbrushed watercolor on strathmore board, 30 in. by 40 in., ninth and tenth semesters.

A

B

Regional planning. Redevelopment of the Wabash River Valley. Map of possible replanning showing reforestation of flood plains and development of dispersed new towns to achieve better balance of employment in industry and agriculture **A**. Detail of area outlined in red in A. Hilly areas and flood plains are developed as forest, and small dams built to create reservoirs for flood control and recreation. Dispersed settlement units with light industry and workshops among the fields are introduced to give diversity and balance to the local economy **B**. Ink and airbrushed watercolor on strathmore board, 30 in. by 40 in., ninth and tenth semesters.

Regional planning. Redevelopment of the Rock River Valley. Possible replanning of the central portion of the valley from Rockford, Illinois (bottom) to Janesville, Wisconsin (top). Photograph of model, eighth semester.

WHAT IS A REGION?

Professor Ludwig Hilberseimer (From *The New Regional Pattern,* 1949)

What, then, is a "region"? There is no easy answer to that question. The determination of a region will always be difficult and even controversial. Some consider the city with its environments a region. Some think that the state, or a division of a nation according to administrative necessities, comprises a region. A geographical unit—a river valley or a plain—has also been taken as a region's essential feature. Climate, soil and resources have been regarded as determining factors, also certain kinds of production, agricultural and industrial. We speak of agricultural or industrial regions. A region might also be defined in terms of its living standard, its cultural expression, or its industrial function. Administrative boundaries are man-made, more or less artificial in scope and readily changeable, whereas the other mentioned factors are more or less organic. They may thus be regarded as determining factors for a sound regional development.

For we may define a region as an organic entity, an organism in which the whole is related to the parts, as the parts are related to the whole. A region, then, is something which can exist, something which can live and support life. A region is an interrelated part of a country, a natural unit, self-containing by reasons of geographical advantages, natural resources, and soil conditions, natural and man-made transportation routes, developed and used by its population.

Within a region, thus defined, there could be balanced production, based on diversified agriculture, and an industry devoted to processing the native raw materials. Each community of the region would be an interrelated part of the whole. Each community and each individual would have an equitable share in the region. Everything would be planned for the benefit of the individual as well as for society as a whole. Thus, an organic regional life could be created, an economic, social, and cultural entity. . .

Ecology, the branch of biology which deals with the relation of organisms to their environments, has taught us that the landscape, with all its vital force, man the animal included, is an integrated whole, based on a natural cooperation, on a comprehensive symbiosis. Man, however, unlike plant or animal, is not bound to the landscape. To a certain extent he is free to choose his environment. However, when he chooses he becomes part of his chosen landscape, depending on it as do all other creatures. Although he is dependent, he has freedom to act. He may act according to the laws of nature, in harmony with them, or against them. Whatever he does, will influence the landscape, and thereby influence his own existence.

As a whole, the landscape is an organism. The better the general care it receives, the better its condition and endurance. Interference with the laws of nature may result in a disease of a part. And inevitably, because the landscape is an organism, disease of a part becomes a disease of the whole. When man obeys the laws of nature, he will find abundance; when he disobeys them, he will meet want and poverty.

ARCHITECTURE SEQUENCE

The architecture sequence, extending through the fourth and fifth years, brings together all of the student's previous work in drawing, visual training, engineering, history, construction and planning. It begins with two groups of exercises that consider painting and sculpture in their relationship to architecture, and space as an architectural problem. With this final preparation, a synthesis of all previous studies becomes possible. The students are now ready for free creative work within the discipline established by the educational process. In several independent projects they proceed to consider architecture as the art of building, to seek a higher degree of clarity of construction, function and space. The ultimate aim of the art of building is to achieve a sense of harmony in a work — only then can it transcend into architecture.

Concurrently the sequence investigates the role of architecture in our civilization. It seeks to clarify the compelling and supporting forces of our times, and how they shape our buildings. From this analysis the student may better comprehend the potentialities of our architecture, with the understanding that it depends on the epoch.

The first group of problems in the seventh semester explores painting and sculpture in their relationship to architecture. In our time, painting and sculpture have become independent personal statements of the artist. In the past, direct integration of sculpture and painting with architecture was possible, because their creators shared a common viewpoint and aims; today such integration is very difficult. A good alternative appears to be for the architect to select an existing painting or sculpture, either contemporary or from the past, and to position it within a space in such a way that both the object and the space are enhanced and intensified by their mutual interrelationship. One example of a problem used in exploring this approach is a collage study, in which appropriately scaled photographs of paintings and sculptures are placed in a drawing of a given spatial context. Some examples of this type of problem include a painting and a shelf placed on a wall, two paintings placed on a wall, a painting on a wall and a sculpture nearby, and two sculptures related to a free-standing wall. The student considers many possible choices of objects by comparing two study-versions of the collage, gradually converging to a good solution, which is recorded in a finished plate.

Together with the abstract problems in painting and sculpture, space as an architectural problem is explored in two related exercises. In them the scale model is the essential means for the study of space. With the models the students investigate the new visual possibilities of space created by the industrial age. Large glass areas make possible the mingling of interior spaces with the landscape. Skeleton construction eliminates interior bearing walls, dissolving the compartmented room and permitting an open, flowing continuum of space, divided or rather modulated by elements placed in it. Indeed it can almost be said that the space itself is evoked by the positions of these modulating elements — one thinks of Liebniz' definition: "Space is nothing more than the relationship between objects".

The study of space is introduced by a problem involving a small bearing wall building with a simple function such as a weekend house or a private studio. The students concentrate their attention on the bounded interior space defined by the bearing walls. Working with a study model, they divide the interior with a few carefully placed planar partitions, setting up a flowing sequence of spaces which are related to the landscape by openings cut in the walls. The size and placement of the openings and par-

titions is carefully controlled to maintain the character of bearing wall construction with a clear relationship of supporting and supported elements. The students present their solutions with drawings and with collages derived from the painting and sculpture problems.

In the next problem the bounded space of the bearing wall building is expanded by pushing out one or two of its walls to form walled courtyards. In the resulting court house the enclosed space is now under a roof plane, partially supported by interior columns, its openings infilled with glass. The spatial differences revealed in the court house, with its visual mingling of interior and exterior areas, at once suggest a whole new range of spatial possibilities and functional implications to be explored. Working abstractly at first, the student divides the enclosed area under the roof plane with freely placed partitions, again using a model. Many possible relationships between partition planes, the roof plane and its supporting columns and the adjoining courtyards are tried, seeking visually coherent configurations of these elements.

Following these abstract studies of the court house space, the student explores its relationship to function by developing a residence or some other simple use within it. At the same time the student considers how this function and its spatial context can emerge from the facts of construction. Planning elements that require enclosed rooms such as kitchens or toilets are treated as "cores" formed of aggregates of straight or curved walls. Other areas may be defined by low screen-like elements or panels of drapery. This phase of the court house problem also includes the study of the placement of paintings and sculptures to define and enrich both interior and exterior spaces, the selection of finish materials and colors, and the choice and arrangement of furniture. The final version of the court house is presented with drawings, collages and a finished model. In this problem the collage is further developed as a means for the study of space. By inserting photographs of paintings, sculpture or landscapes, and even actual materials such as wood or fabric into collage projections of the building's interior, further insight is gained on the role these elements play in the evocation of spatial qualities.

After these introductory studies, the eighth semester is spent on a problem consisting of the complete development of a small building with a given program and site, using a skeleton structure in steel or concrete. The student now begins to explore architecture as the art of building, bringing together all previous studies into an integrated method of thinking and working.

The problem begins with the definition of the building's function by a precise program of user requirements and floor areas. From the program the student develops a functional solution of planning elements, seeking to clearly understand their interrelations. The functional solution begins to establish the building's character, its relation to its site, and how its planning elements may be ordered, according to axial symmetry or an asymmetrical free plan. It also begins to suggest how the building may be realized in construction. Starting from a sure and sensitive command of construction, the structure is evolved, choosing the material and system appropriate to the building's character. The plan influences the module and bay size, the scale of span and height suggests the system and its constituent material. One must also consider the quality of space the structure creates, allowing it to reflect and enhance the building's character. Then the enclosure, with its disposition of opaque and transparent elements, must be developed in an organic relationship to structure and plan.

The development of an appropriate plan, structure and enclosure, this is the first level that the student must achieve. Only then can the process of clarification begin. The plan must be clarified to give a smooth flowing relationship of elements and satisfying proportions to all its rooms and spaces. The structure must be clarified by careful study of its basic configuration, the proportions of its members and its details to give an elegant but unobtrusive articulation of its parts and their functions. The enclosure must also be clarified by the proper selection of proportions, materials and details. Both interior and exterior can

be further enriched by the honest expression of the natural color, texture and pattern of materials, the controlled composition of mass-produced elements, and the careful placement of a few well-chosen paintings and sculptures. It must be emphasized that the process of clarification does not involve decorative application, but is the evocation of expressive and aesthetic qualities from the basic facts of function and construction.

These are some of the considerations involved as the students develop their solutions to the skeleton problem, finally presenting the finished building project with a model, drawings and collages. The architecture sequence presents the art of building above all as a rational process. It seeks to show that architecture can be made using reason and responsible judgement instead of uninformed opinion and personal whim. The aim of the art of building is to take the given characteristics of function and construction and by a process of clarification make them into a harmonious whole, expressive not only of their true natures, but of the significance of our age as well.

In the ninth semester, the student again does several exercises. One of these can be a more abstract study of building enclosures, exploring their visual possibilities, often using a skeleton building with an exposed steel or concrete frame. Different possibilities are tried in simple block study-model, with the enclosure elements indicated by colored papers applied to the elevations. Within the given structural frame many variations in proportion and placement of glazed and opaque infill elements are studied, always relating them to construction. After a solution is reached in the study-model, it is recorded in a collage of the building elevations.

Another type of exercise involves the study of several of the archetypal buildings of the industrial age, such as the high-rise office or apartment building. Using the method developed in the skeleton problem, solutions are evolved giving careful attention to structure, core elements, flexibility of interior space, and the relationship of the building to an urban setting. The enclosure is also studied, using a wide range of opaque and transparent materials, including clear, tinted and reflective glass, brick, marble, granite and various kinds of metals. The solutions are presented with drawings and collages.

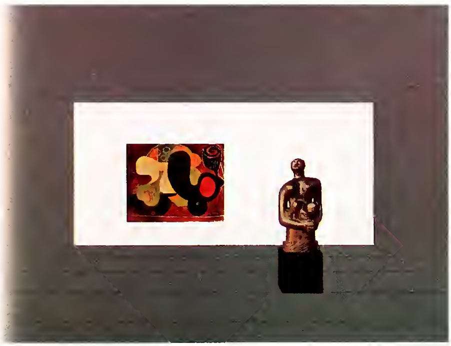
In the ninth and tenth semesters the students also take a course in architectural practice, studying codes, contracts, specifications and other legal and technical aspects of the profession.

In the tenth semester, the students do a final project. It is usually one of larger scale and complexity, often set in an existing urban context. The site and character of the problem vary from year to year. Starting from a program which they help to define, the students, often working in teams, go on to develop their architectural solutions to it. The methods embodying the art of building introduced earlier are again applied, with greater depth, producing completed projects that are presented with drawings and models.

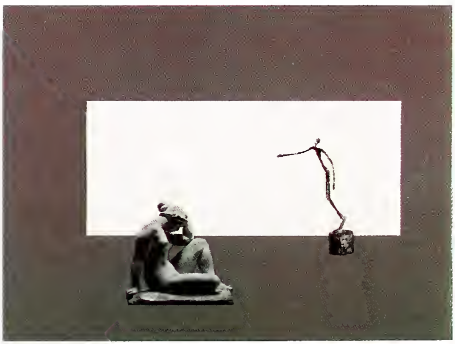
Throughout the architecture sequence, in a series of seminars and informal discussions, the student considers the role of his profession in our society and culture. Architecture, like all human activities, is inextricably embedded in the civilization from which it grows. As our civilization evolves, each epoch adds its unique significant ideas to the main stream. The architect must be aware of the great ideas and forces that have influenced the past, and seek out those of the present that seem equally significant. The architect must draw upon these complex truth-relations of our civilization, shaping his buildings to respond to the future they will serve. One must also be aware of the levels of significance within civilizations. Every building has its position in these strata, and not every building is a temple or a cathedral. In our time, the industrial idea has been dominant, establishing new building types and technologies which the architect must master. With the means our time affords, the architect must seek to realize his art, bringing forth its essential harmony.

A

B

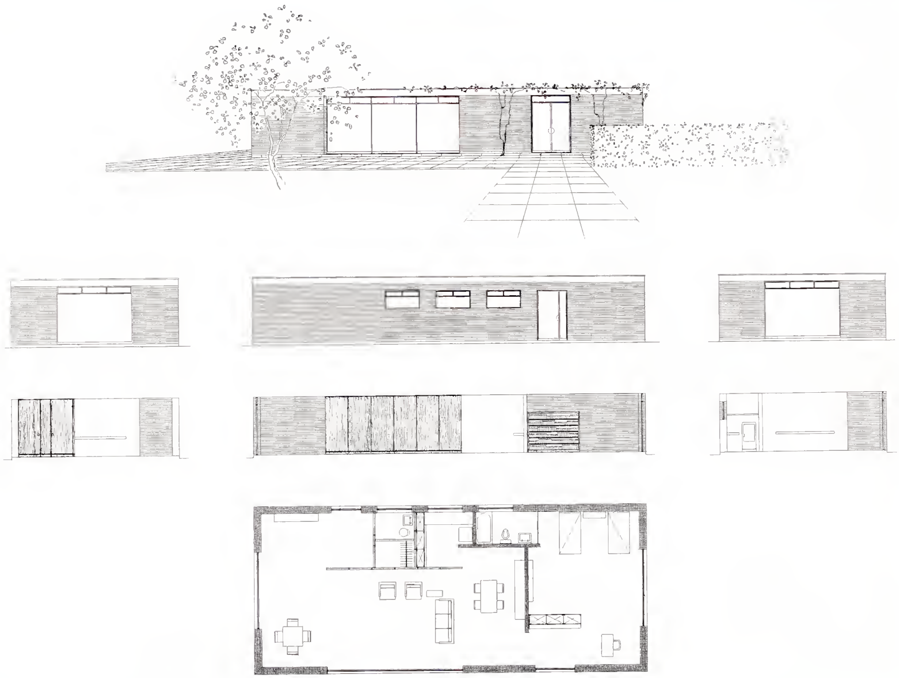


C



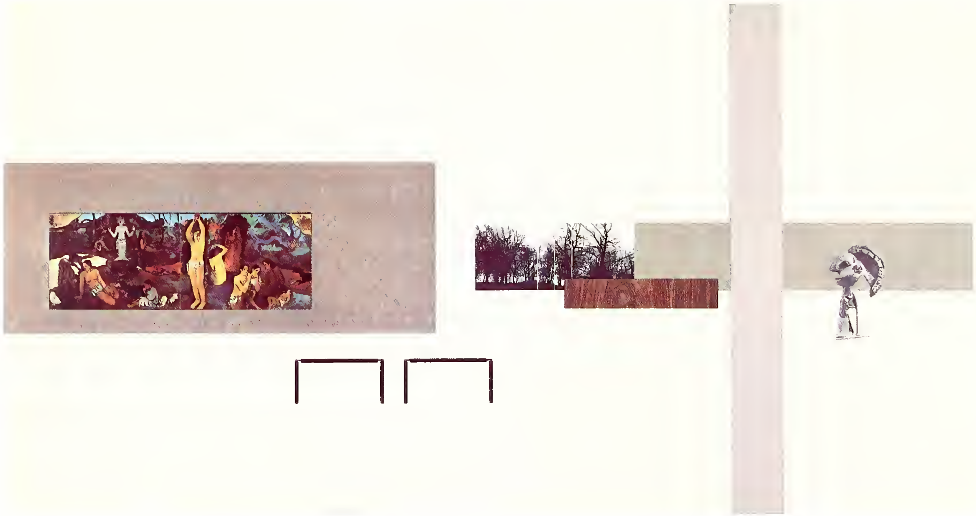
D

Painting and sculpture studies. One painting and a shelf on a wall **A**, two paintings and a shelf on a wall **B**, painting on a wall and a sculpture nearby **C**, and two sculptures related to a wall **D**. Ink and collage on grey illustration board, 15 in. by 20 in., seventh semester.

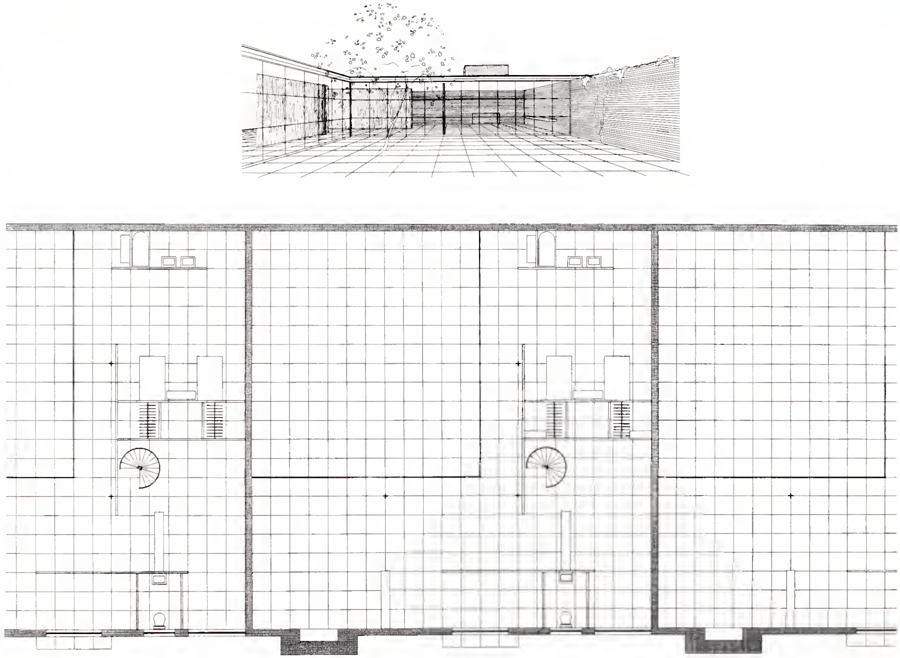


Bearing wall space study. Small house in brick; plan, elevations, sections and perspective view. Pencil on strathmore board, 30 in. by 40 in., seventh semester.

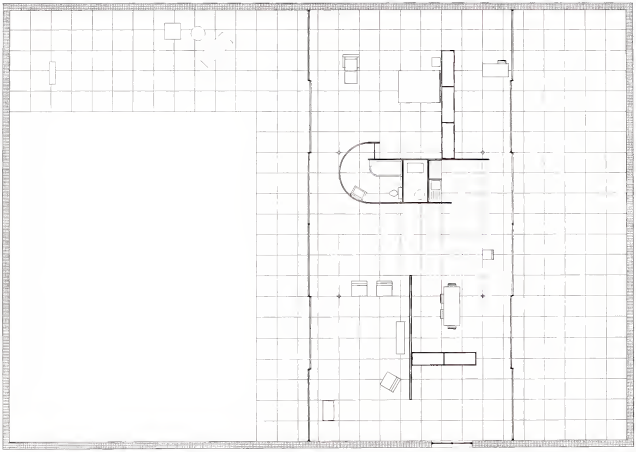
Bearing wall space study. Small house in brick; plan and elevations. Pencil and collage on strathmore board, 30 in. by 40 in., seventh semester.



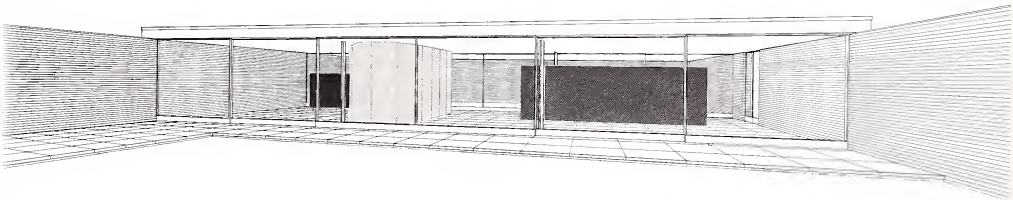
Bearing wall space study. House in stone; interior view. Collage on illustration board, 30 in. by 60 in., seventh semester.



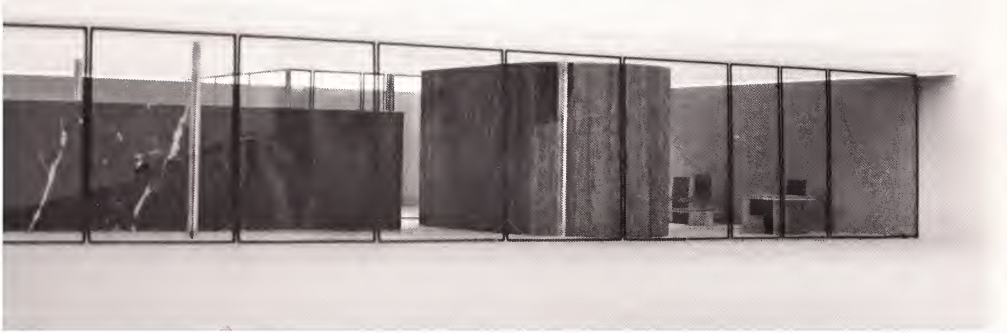
Courthouse space study. Row of attached court houses; plan and perspective view of court. Pencil on strathmore board, 30 in. by 40 in., seventh semester.



Court house space study. Free-standing court house; plan. Pencil on strathmore board, 30 in. by 40 in., seventh semester.

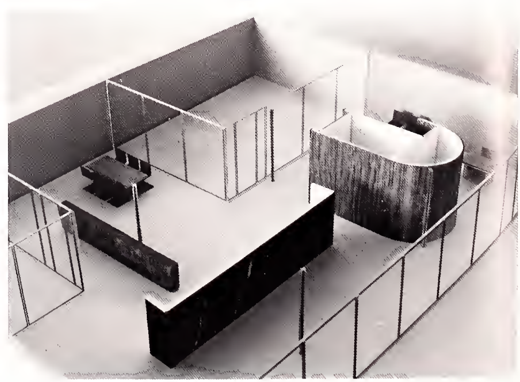


Court house space study. Free-standing court house; perspective view from large court. Pencil on strathmore board, 30 in. by 40 in., seventh semester.



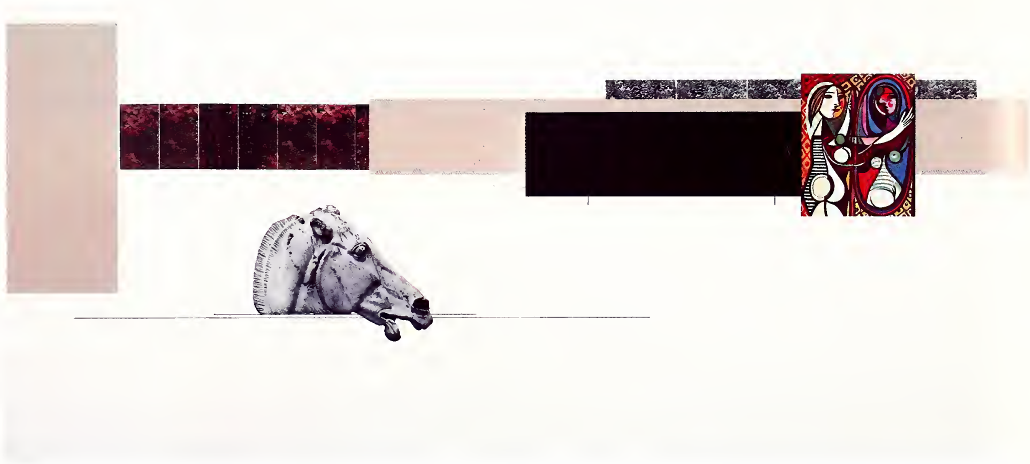
A

B

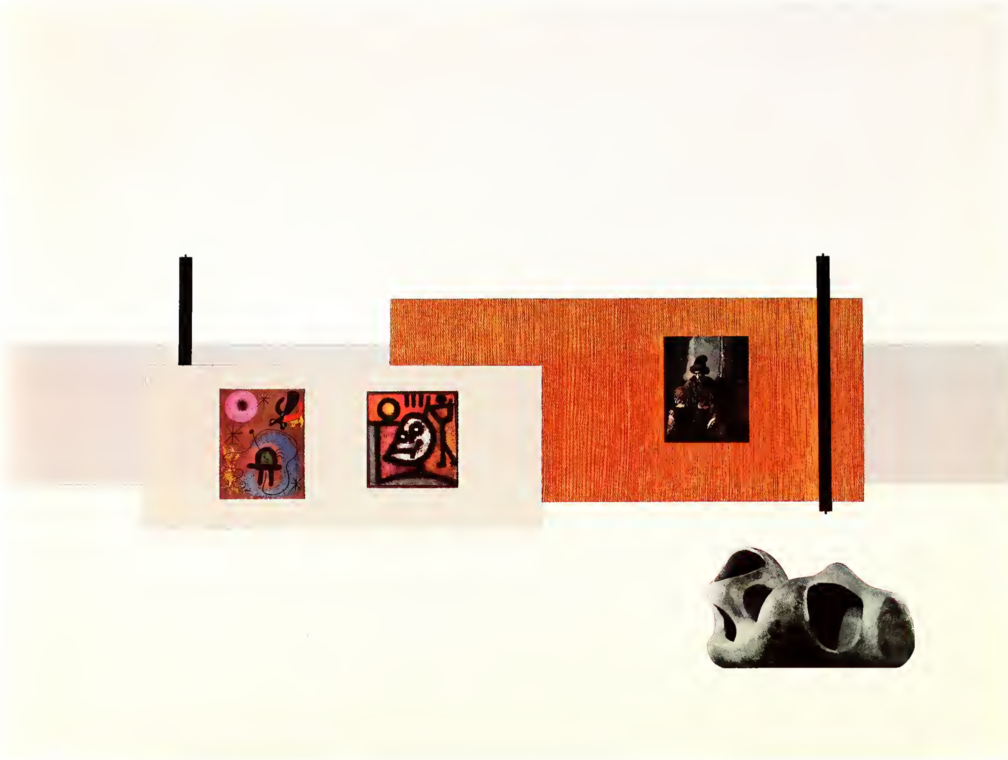


Courthouse space study. House with three courts. View from large court **A** and aerial view with roof removed **B**. Photographs of model, seventh semester.

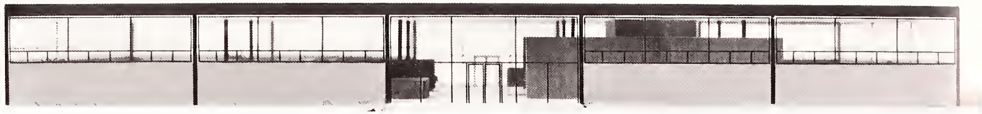
Court house space study. A residence; plan. Ink and collage on grey illustration board. 30 in. by 40 in., seventh semester.



Court house space study. Interior view. Collage on strathmore board, 30 in. by 40 in., seventh semester.



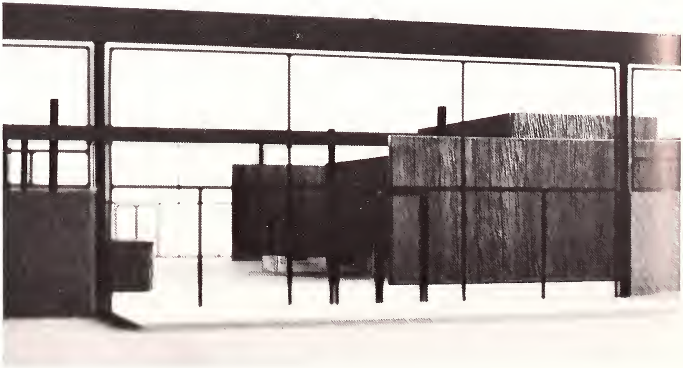
Court house space study. Interior view. Collage on strathmore board, 30 in. by 40 in., seventh semester.



A

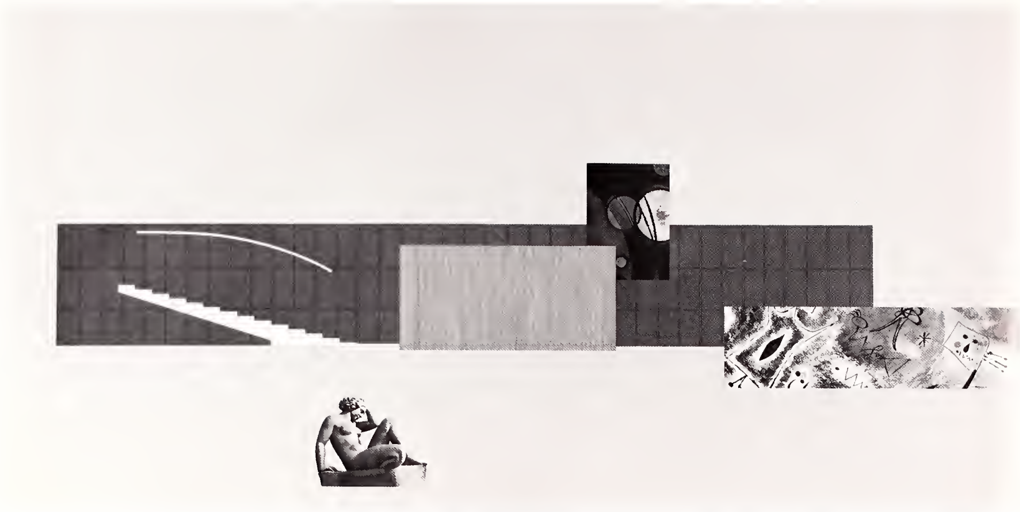
B

Building with steel skeleton. Branch library. View of elevation **A** and view of entrance with reference area beyond **B**. Photographs of model, eighth semester.



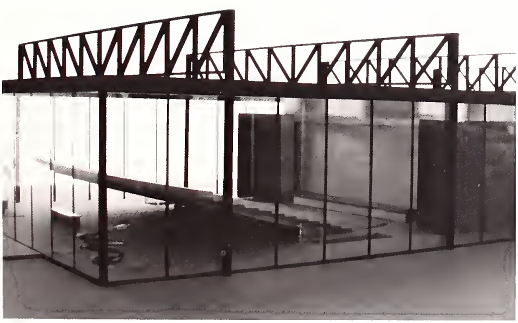
B

Building with steel skeleton. Art museum; view of interior with wall removed **A**, view of entrance **B**. Photographs of model, eighth semester.

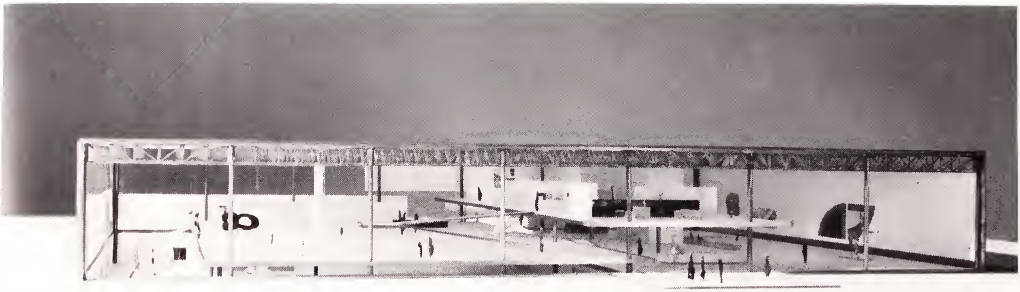


A

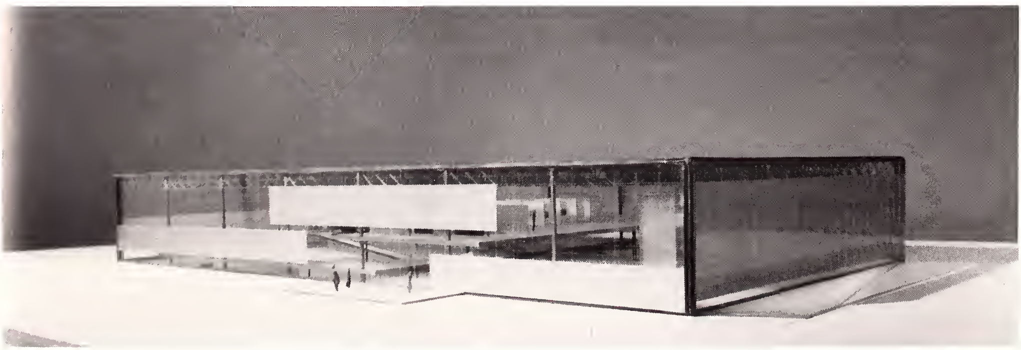
B



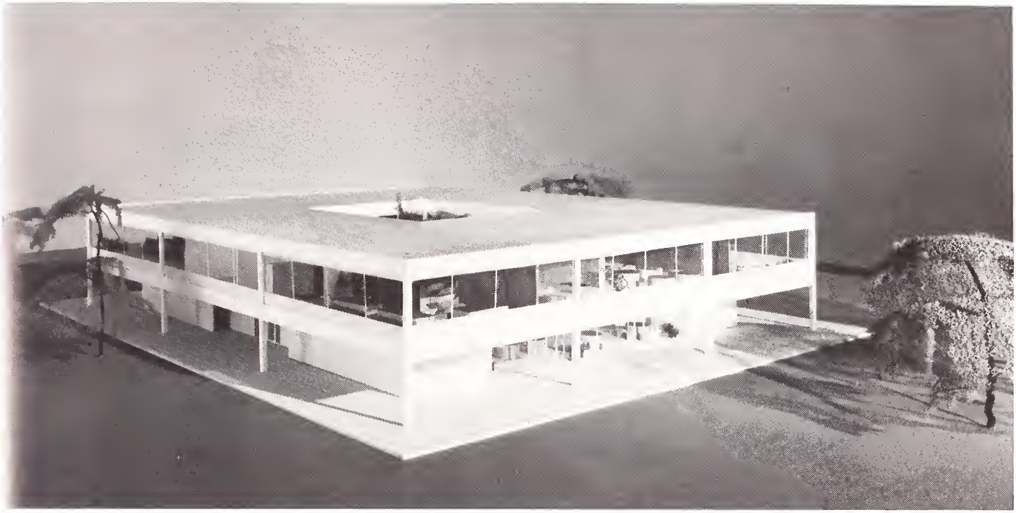
Building with steel skeleton. College exhibition center. Interior view **A**, collage on illustration board, 30 in. by 40 in.; exterior view looking into auditorium **B**, photograph of model; eighth semester.



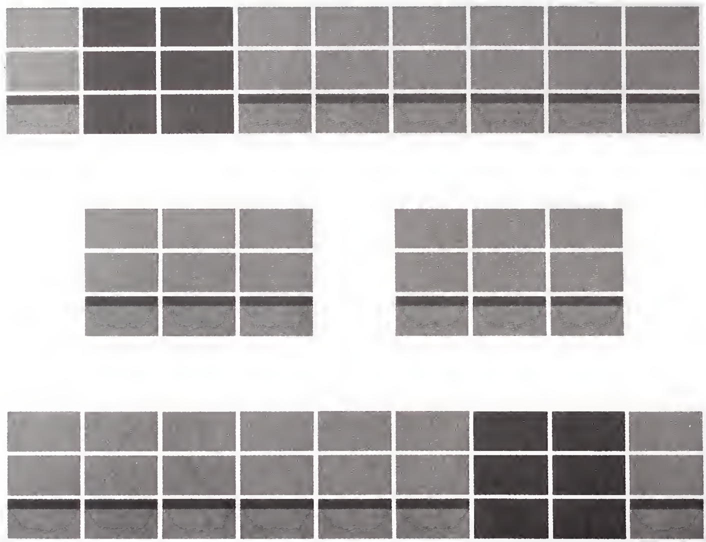
uilding with steel skeleton. Art museum; ew of interior with wall removed **A**, view entrance **B**. Photographs of model, ghth semester.



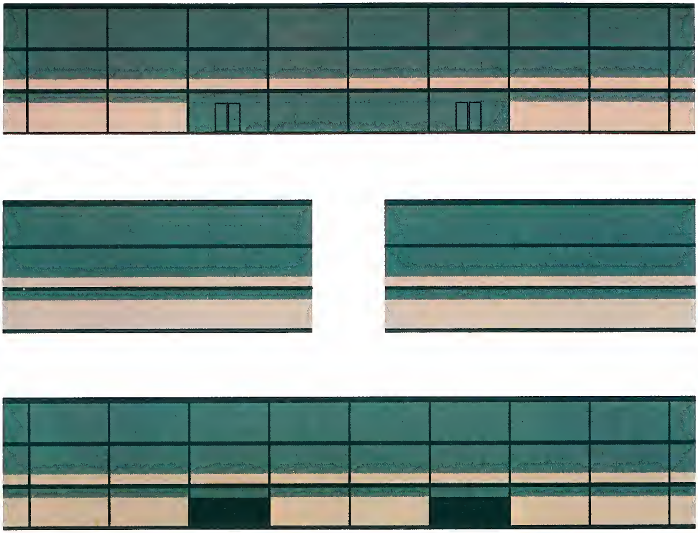
Building with steel skeleton. Library. Photograph of model, eighth semester.



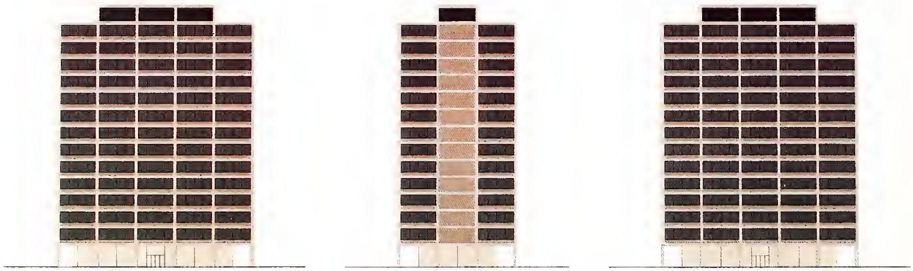
Building with steel skeleton. Elementary school. Photographs of model, eighth semester.



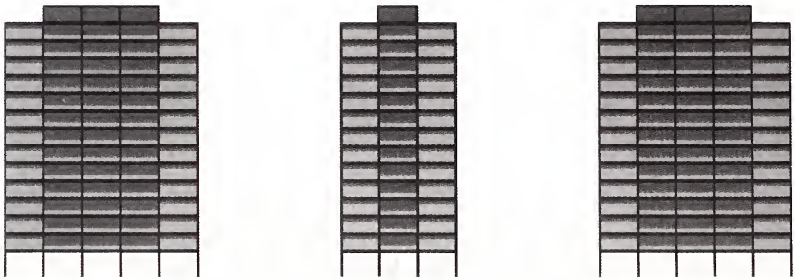
Enclosure study. Low-rise concrete frame building with brick and glass infill walls; elevations. Collage and ink on strathmore board, 30 in. by 40 in., ninth semester.



Enclosure study. Low-rise steel frame building with brick and glass infill walls; elevations. Collage and ink on strathmore board, 30 in. by 40 in., ninth semester.



Enclosure study. High-rise concrete frame building with brick and glass infill walls; elevations. Collage and ink on strathmore board, 30 in. by 40 in., ninth semester.



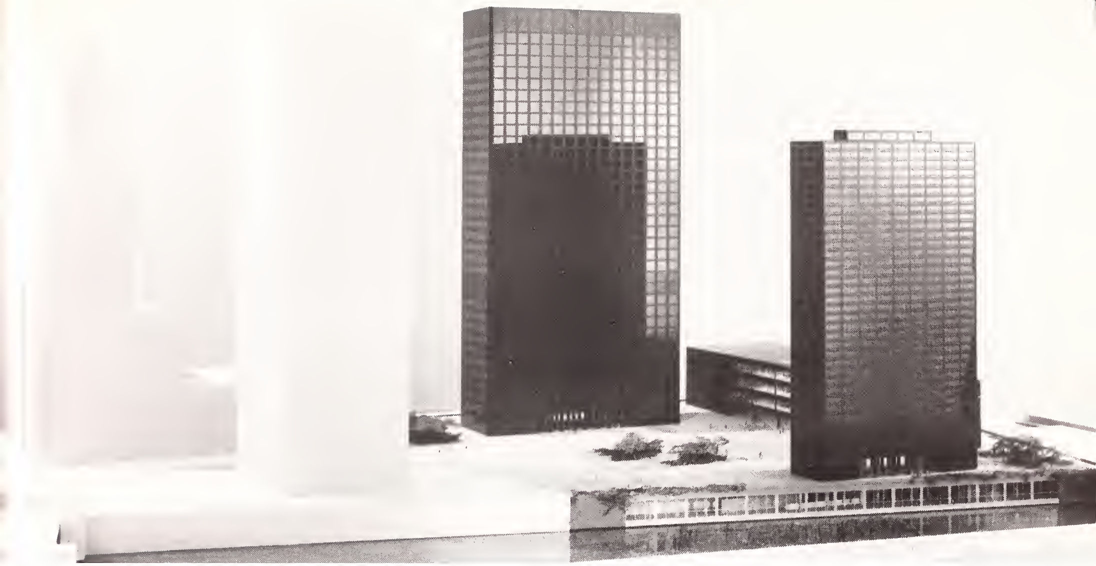
Enclosure study. High-rise steel frame building with brick and glass infill walls; elevations. Collage and ink on strathmore board, 30 in. by 40 in., ninth semester.

Project. A university campus; perspective view. Pencil on strathmore board, 30 in. by 40 in., tenth semester.

Project. A residential development with row houses and high-rise apartment buildings; perspective view. Pencil on strathmore board, 30 in. by 40 in., tenth semester.

View from Columbus Drive showing the stairway leading to the commercial building; its lobby opens on to the plaza beyond, which is flanked by the office and apartment buildings **A**

A



View from the river with the apartment tower in the foreground, the office building on the far side of the raised plaza, and a commercial arcade at the river's edge **B**

Project. Mixed use development with offices, apartments and commercial facilities located on the north bank of the Chicago River at Columbus Drive, Chicago, Illinois. Photographs of model, tenth semester.

Project. Mixed use development with offices, apartments and commercial facilities located on the north bank of the Chicago River at Columbus Drive, Chicago, Illinois. Photographs of model, tenth semester.

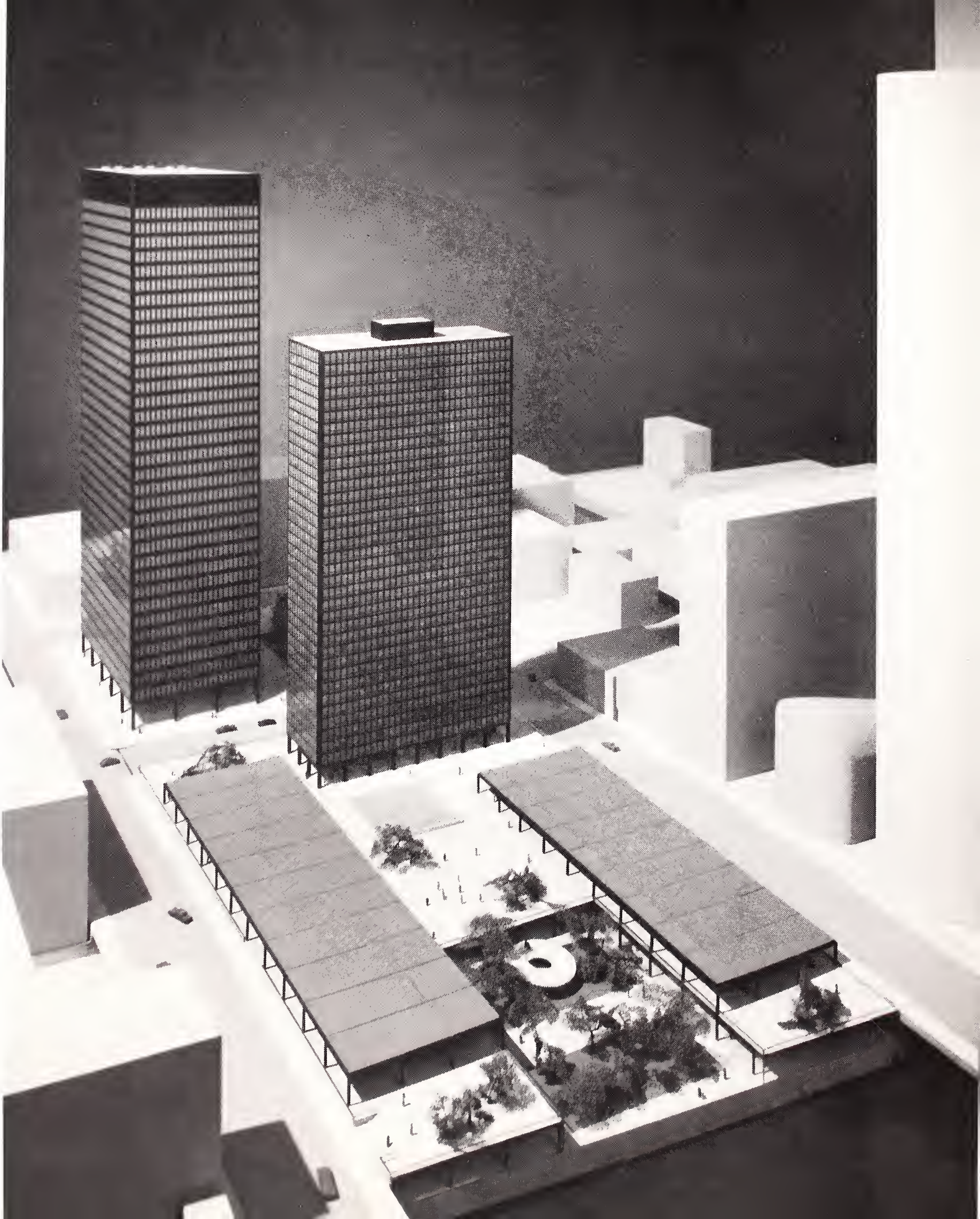
View facing south with the office building in the foreground rising from a three-story commercial structure, with the apartment building beyond, all on a raised podium **A**.

Project. Mixed use development with offices, apartments and commercial facilities located on the north bank of the Chicago River between State and Dearborn Streets. Photographs of model, tenth semester.

View from the river with the apartment building and some commercial spaces facing a riverfront park; the office building and commercial structure are in the background **B**

A

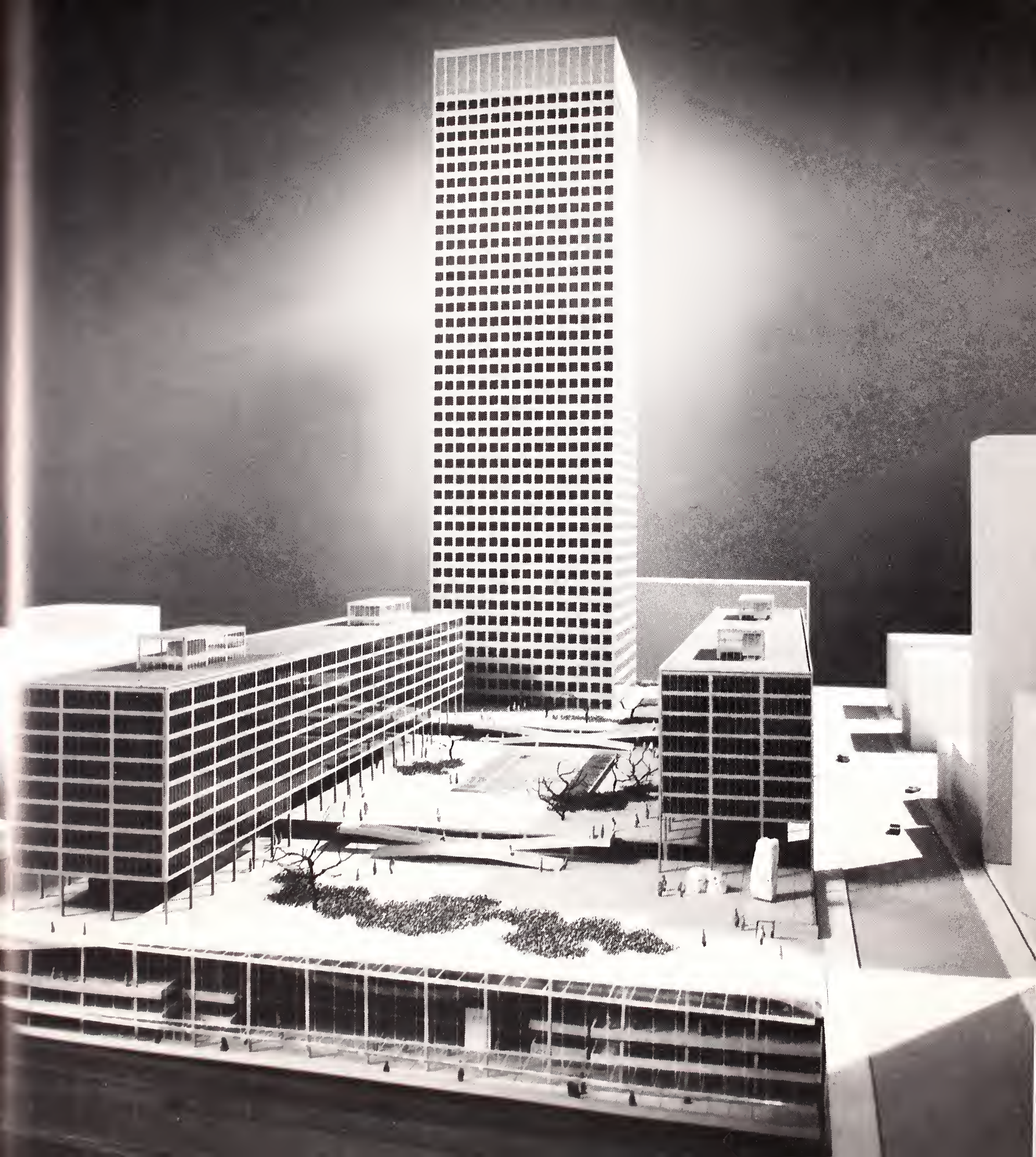
B

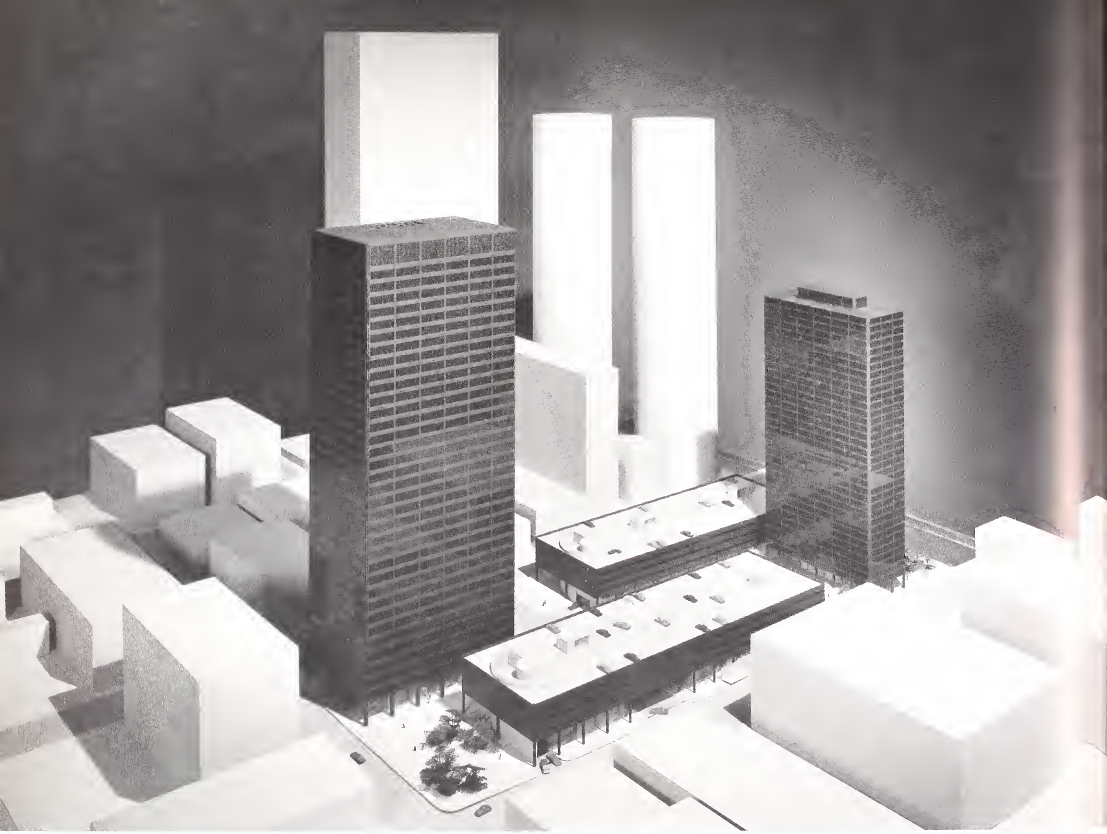


A

Project. Mixed use development with offices, apartments and commercial facilities located on the north bank of the Chicago River between State and Dearborn Streets. Photographs of model, tenth semester.

Views from the river facing northeast **A** and northwest **B**, showing the office tower rising at the north end of the site, with two low-rise apartment buildings flanking a three-level plaza which steps down towards the river. Commercial space is located beneath the plaza and is lighted by a skylight in the middle plaza level, and a glass promenade at the water's edge.





View facing southeast showing the office building at the northeast corner of the site and the lower apartment tower at the river's edge; the two low structures house parking and commercial space.

Project. Mixed use development with offices, apartments and commercial facilities located on the north bank of the Chicago River between State and Dearborn Streets. Photographs of model, tenth semester.

GRADUATE PROGRAM

THE IIT GRADUATE PROGRAM IN ARCHITECTURE

A master's degree program in architecture was introduced at Armour Institute of Technology in 1932. The students were required to complete a number of graduate level courses and prepare a thesis. The program attracted few students in its early years during the great depression.

After Mies came to Armour in 1938 he continued the master's degree program, acting himself as adviser to most of the students. He later added a number of preparatory courses for non-IIT students, to introduce them to the rational method of the undergraduate curriculum before starting on their theses. Students coming from the IIT undergraduate program could start on their thesis projects at once.

In the thesis projects done under his direction, Mies followed a way of work similar to that of the undergraduate architecture sequence. Here the students began by developing a clear perception of the requirements of their building type. This understanding led to a definite program for the project, and a functional solution of its components. Simultaneously the appropriate structure was developed in keeping with the scale and character of the building. Although a clear structure was an essential requirement, the architectural emphasis of it could vary from bold to subtle. Structure and function were interrelated and refined by the extended study of proportion, spatial quality, materials and details, using drawings and models. At the graduate level this process of refinement was pursued in much greater depth and with greater intensity, seeking to realize through clear construction that vital sense of harmony or *concordantia* and to clearly express the spirit of the age.

The building types chosen for theses covered a wide range; they included the office building, the university campus, the public museum, and the great halls for concerts, exhibitions and conventions. They represented functions created by the industrial age to meet its unique needs and aspirations. Mies said, "Architecture is the will of the epoch translated into space". He believed that this range of building types was a part of the challenge to the architecture of our time, it must acknowledge the different levels of value our society assigns to different functions, yet have a sense of enduring quality and unity throughout.

In their thesis projects Mies' graduate students also examined the technology of the industrial age and its implications for architecture. The materials the industrial world produced, not only new ones such as steel, aluminum and concrete but older ones such as brick and glass, were carefully considered. Their properties and uses must be understood and accepted, their expressive qualities must be explored. The structural systems made possible by these new materials have permitted longer spans with fewer supports, suggesting a new freeness in spatial arrangement. These systems have also made the tall building possible. Skeleton construction in steel or concrete allowed buildings to be clad in light enclosures, with transparent and opaque areas freely placed anywhere on their surfaces. The realization of the potentialities of our construction was another part of the challenge posed to the architecture of our time.

Ultimately Mies was seeking an architecture that would express the truth of our time, in the sense of "Truth is the significance of facts". How could the functional types and structures of our buildings be clarified by the elimination of superfluous parts and by the process of refinement? And how could all the elements of a building be fused together to form a limpid definition of the significance of our epoch, and thus worthily reflect its greatness? It was questions such as these that he sought to explore in the

graduate school over a period of twenty years.

When Mies retired from teaching in 1958, his position in the graduate school was briefly held by his colleague A. James Speyer, who had been his first graduate student at Armour.

In 1961 Myron Goldsmith, a partner at Skidmore, Owings and Merrill, came to IIT as a Professor of Architecture and was appointed by Professor George Danforth to head the graduate program. Goldsmith had been one of Mies' early undergraduate students at Armour; he later worked in his office and took a master's degree with him. Goldsmith continued the basic graduate course established by Mies, which included an introductory year for non-IIT students before starting on their theses. He also brought Fazlur Khan, a noted structural engineer and partner at Skidmore, Owings and Merrill, to IIT in 1963 as an Adjunct Professor of Architecture; Khan acted as co-advisor with him on many thesis projects. In addition to Goldsmith and Khan there were a number of other faculty members who acted as independent thesis advisers.

In 1953, Goldsmith had completed a master's thesis with Mies entitled "The Tall Building: The Effects of Scale". This thesis was an independent project, and in it Goldsmith announced a major theme that he would later pursue with his graduate students. The thesis presented the idea that in architecture, as the function of a building requires a larger span or greater height, the scale of span or height has a decisive effect on the structural system chosen, and the whole architectural character of the building. A structural system that can be used at a small scale cannot be indefinitely enlarged or made spatially more flexible to serve new functions. For each structural system and its constituent material, there is an optimal range for its efficient and economical use. Goldsmith pointed out that this idea of the effects of scale had a long tradition in other fields, having first been set forth by Galileo in his *Two New Sciences* of 1638, and its implications in biology extensively explored by D'Arcy Wentworth Thompson in his great work on *Growth and Form,* but had not been applied in architecture. Goldsmith suggested that there is an overlapping succession of structural systems that in turn become appropriate solutions as the magnitude of the height or span of a building increased. Each of the systems in this succession presents different possibilities for functional application and architectural expression.

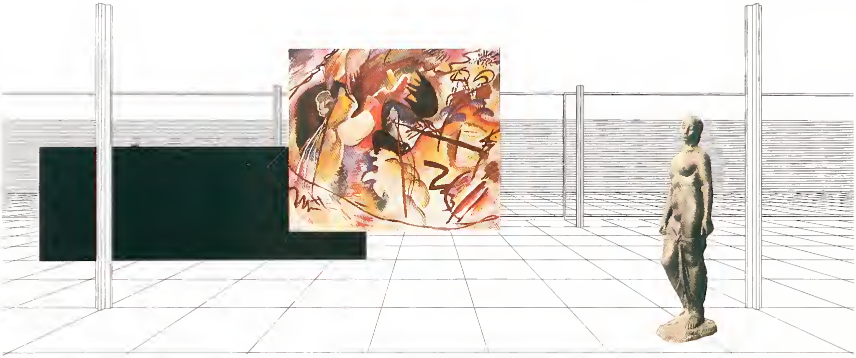
Goldsmith believed that the optimal systems for buildings of shorter span and lower height were already well-defined. In the thesis projects done under his direction, he therefore encouraged his students to explore larger scale buildings using existing structural systems, or even developing new systems, finding their practical limits and studying their architectural expression. He believed that a clear and reasonable structure with the greatest economy of means for its scale would also be capable of architectural refinement in the proper application. The development of such a building of larger scale involved a process of careful consideration and judgement to arrive at a solution that was functionally and visually appropriate. The end result must not only meet rigorous criteria of practicality and economy, but produce an elegant architectural statement as well.

Goldsmith and Khan first turned their attention to long-span building types which were investigated in several surveys of existing structural systems and their range of size in both steel and concrete. Then they extended their studies to longer spans starting with early projects using two-way grids and continuing to tension structures in catenary and cable-stayed systems.

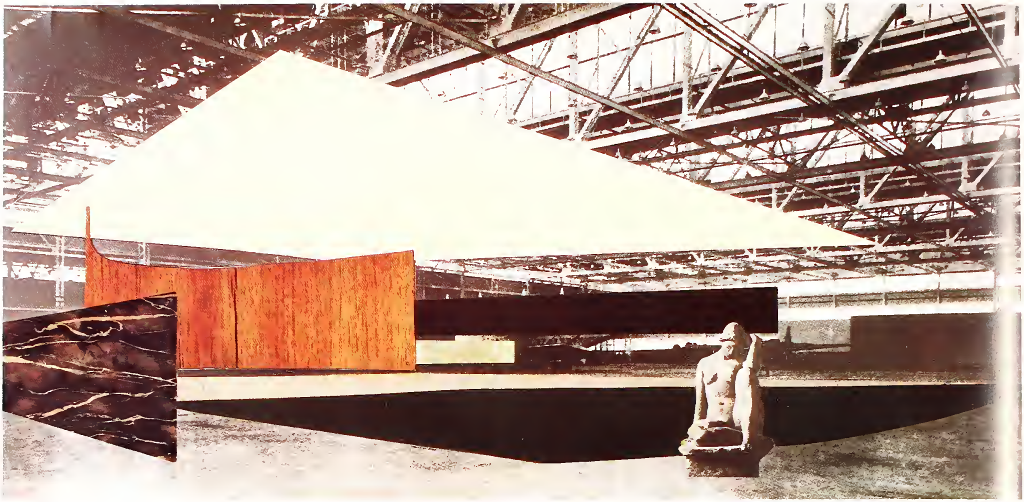
They also began to consider new possibilities for high-rise structures. Khan contributed an important concept that was applied in many of the theses in this area: the tall building with no structural premium for height due to lateral loads. An important new class of structures emerged in part from these studies: the tube systems. The framed tube, diagonally braced tube and finally the bundled tube were all examined in a series of thesis projects. This investigation of high-rise building structures was also accompanied

by the study of related vertical transportation methods, including sky-lobby express elevator systems and double-deck cab elevators. Other examples of systems with no premium for height that were developed included form-stiffened buildings and belt-truss structures.

Goldsmith and Khan's exploration of the effects of scale on structural systems and their architectural expression at larger magnitudes of height and span proved to be a fruitful one. A number of these projects served as prototypes for significant buildings of recent years, and may point the way to others in the future.



Museum for a small city. View of interior facing toward outer courtyard. George E. Danforth; Ludwig Mies van der Rohe, adviser. Collage on strathmore board, 30 in. by 40 in., first year graduate study, 1942.



Concert hall. Study of the interrelation of space and finish materials, after a collage by Mies van der Rohe. Daniel Brenner; Ludwig Mies van der Rohe, adviser. Collage on photograph, 15 in. by 29 in., first year graduate study, 1946

AN ART MUSEUM

Daniel Brenner, M. S. Thesis, 1949. Adviser: Ludwig Mies van der Rohe

A small museum, to be located in a park site in Madison, Wisconsin. The collections were to be housed in a two-story building, overlooking a garden enclosed by granite walls. A steel canopy supported on slender columns extended across the garden, marking the entrances, and dividing it into two areas for the display of sculpture. The main building was 144 ft. square in plan, with a steel structure having columns spaced at 48 ft. centers. The columns were of a flanged cruciform shape, made of two I-beams welded together. Both the columns and the exposed steel fascias were to have a spray-metallized coating of bronze. The ground floor of the building would accommodate travelling exhibitions, and serve as a lecture hall when required. The permanent collection was housed in the second floor gallery space. This space was lighted by a square court occupying the center bay, and a full glass wall on the north facade, which faced the garden; the other walls were of opaque black glass. A luminous ceiling provided additional lighting. A small mezzanine suspended in the upper gallery level overlooking the inner court contained staff offices. Workshops, storage rooms, and a lounge area were located below grade. All exhibition material was to be displayed on free-standing panels, supported from sleeves set in the floor on a three ft. grid, giving complete flexibility to show a wide range of works of art.

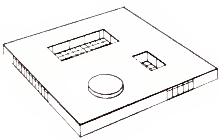
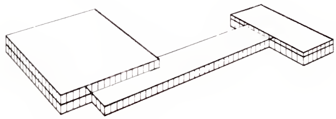
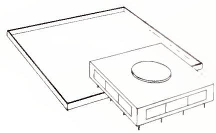
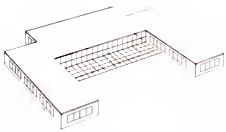
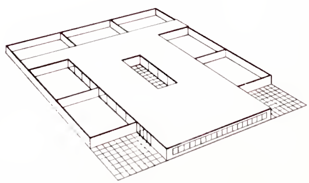
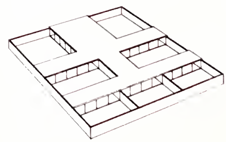
Photographs of models showing the building with adjoining enclosed garden and its canopied entrances **A**, detail of meeting of corner cruciform column and roof fascia beams **B**, and oblique view of building showing north facade of clear glass and courtyard in center bay, with enclosed garden in foreground **C**.

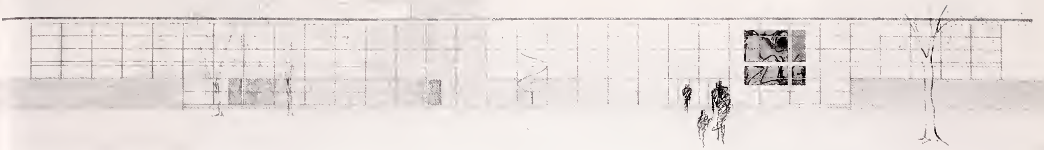
C

A SCHOOL OF ART AND ARCHITECTURE

Charles Worley, M. S. Thesis, 1941. Adviser: Ludwig Mies van der Rohe

After having considered a number of possible functional solutions for this school of art and architecture, it was decided to combine all the studio spaces in one large open hall, so all the students could see the work of the other classes and benefit by these informal contacts as well as their formal instruction. Only spaces that required visual or acoustical privacy would be enclosed. The building took the form of a glass-walled pavilion with a steel-framed roof plate enclosed in plaster, supported by exposed steel star columns spaced at 48 ft. centers in a five by five bay configuration. The edges of the roof plate cantilevered twelve ft. beyond the perimeter columns, and also cantilevered around the edge of a glass-enclosed court which lighted the building interior. A brick chimney block rose through the inner court, and low brick walls enclosed two courtyards on either side of the pavilion. The interior space contained two fixed elements; a life-drawing studio enclosed with splayed and curved walls and lighted by a circular skylight in the roof above, and a mezzanine for faculty offices. The remaining space was to be divided by freely placed low partitions. The building was entered beneath the mezzanine, and the space under it could also be used for exhibitions. A stairway led to a lower level containing a large lecture hall and service facilities.



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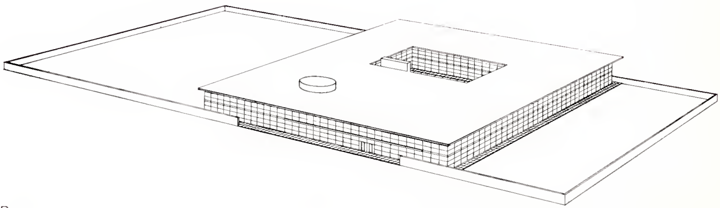
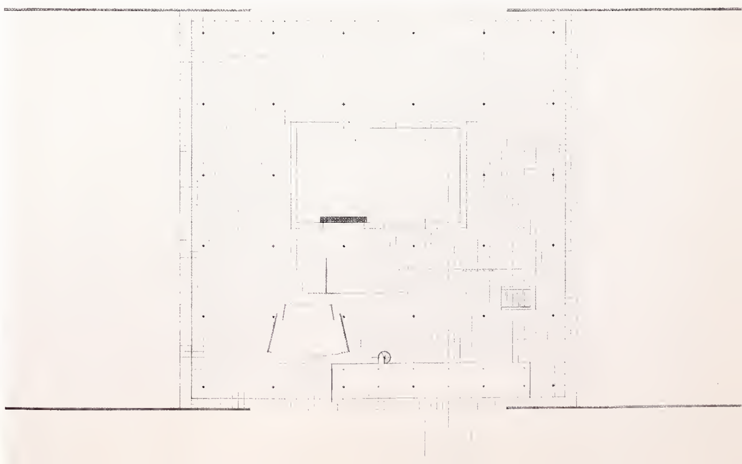


D

Preliminary studies of possible building configurations **A**, entrance elevation **B**, plan **C**, and perspective view **D**

C



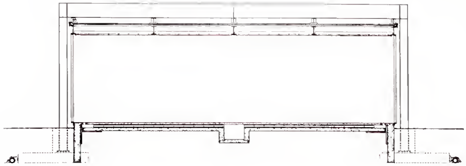
A GLASS AND STEEL HOUSE

Jacques C. Brownson, M. S. Thesis, 1954. Advisers: Ludwig Mies van der Rohe and Ludwig Hilberseimer

This house was actually constructed on a wooded site in Geneva, Illinois. The steel structure consists of a roof plane, 32 ft. by 88 ft., suspended from four steel rigid frames spaced 24 ft. apart. At the west end, three bedrooms face a garden court enclosed by brick walls. Except for a free-standing core element containing the kitchen and mechanical room, the remainder is one flowing space, with glass walls open to the surrounding woodland. At the east end, the glass wall is recessed under the roof to form a porch. The author writes of living in the house: "The inherent beauty of a flowering crabapple branch, the moonlit shadows of trees on the fallen snow, the rivulets of early spring rain on the glass, all are enhanced by the subtlety of the architecture. In a glass pavilion the spectacle of nature is always before you."

Transverse section showing typical rigid steel frame and underfloor hot-air heating system using hollow clay tiles for ductwork **C**, and plan **D**.

Photographs of completed house showing roof plane cantilevered over porch **A**, and view through living room set in the surrounding woodland **B**.



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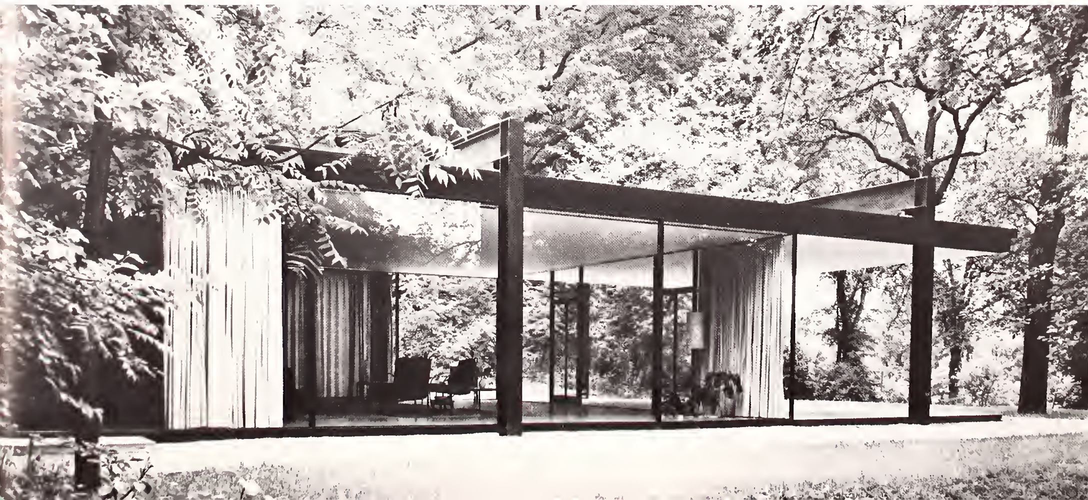
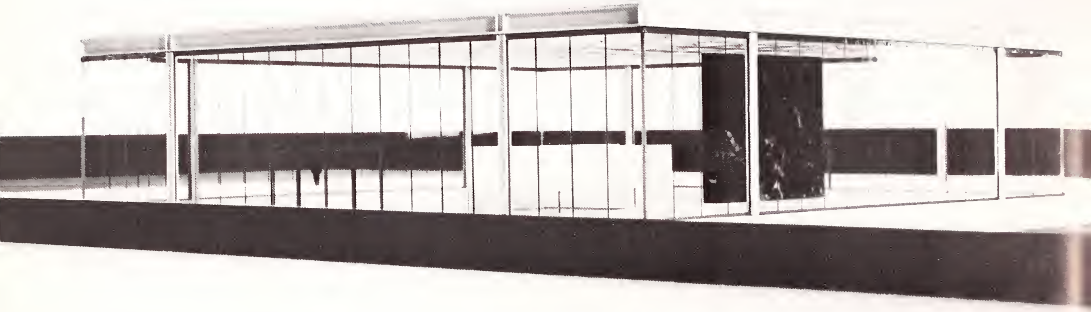




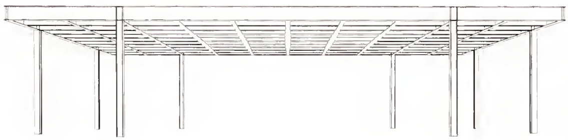
AN ART MUSEUM

Peter Carter, M. S. Thesis, 1958. Adviser: Ludwig Mies van der Rohe

This museum took the form of a 120 ft. square pavilion for the display of sculpture, set in a public park. The roof of the pavilion consisted of a two-way grid of steel beams spaced twelve ft. apart, supported at the perimeter by eight columns 24 ft. high. The walls were of glass, hung in tension from the roof by concealed clamps, and supported against lateral forces by glass mullions at six ft. centers. A free-standing interior core element clad in marble brought air from the roof to the mechanical room below. A stairway led to the lower level, which contained a gallery for the exhibition of paintings, as well as a lecture space, offices and service facilities. The pavilion was surrounded by paved terraces adjoining a pool, and was partially enclosed in low granite walls.

Photographs of model showing view of sculpture pavilion in its setting on a paved terrace bordered by low granite walls **A**, two views along approaching walks from the surrounding park **B**, **D** and perspective drawing of the pavilion structure **C**.

B



C

D

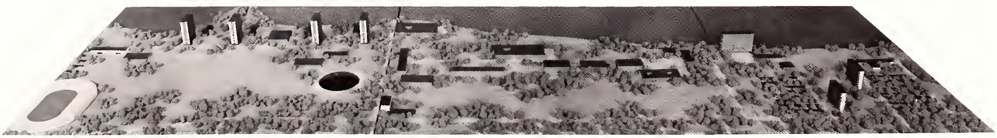
THE REPLANNING OF A UNIVERSITY CAMPUS

James D. Ferris, M. S. Thesis, 1951. Advisers: Ludwig Mies van der Rohe and Ludwig Hilberseimer

The University of Wisconsin at Madison provided the site and program for this campus project. The buildings were grouped together to clearly define the various colleges, residence areas and other elements and yet have a smooth, flowing relationship, all within easy walking distance of each other. The buildings were all further related by standard structural bay sizes that varied from 24 ft. by 24 ft. to 24 ft. by 72 ft. The central area contained the low academic buildings, freely placed around terraces facing the lake shore. The students were housed immediately to the west in four tall dormitory towers close to the dining hall and union, giving each room fine views of the surrounding landscape. Athletic facilities including a stadium and a large domed field house for indoor sports were nearby. To the east of the academic area were faculty houses and high-rise buildings for faculty apartments and the university hospital. The asymmetrical but carefully considered composition of buildings sought not only functional and spatial clarity, but to enhance the natural beauty of the rolling wooded site overlooking Lake Mendota. The university was set apart from the city in its park-like environment, yet remained closely related to it.

B

Photographs of model showing overall view of the replanned campus with Lake Mendota in the background: beginning at left, stadium, school of agriculture, student housing in four high-rise towers, athletic facilities including domed field house, academic buildings, high-rise tower for university hospital, and faculty housing and apartment buildings **A**, view of athletic facility with field house and student housing in the background **B**, and view of terrace facing the lake partially enclosed by academic buildings **C**.



A

AN OFFICE BUILDING

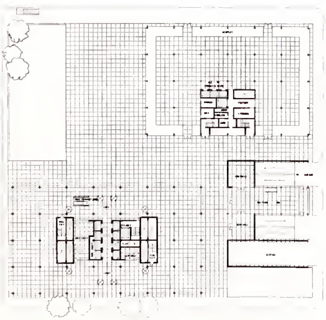
Gunther Rothe, M. S. Thesis, 1957. Advisers: Ludwig Mies van der Rohe and A. James Speyer

The site chosen for this office and commercial development was a full block on Chicago's near north side. The office space was housed in a 31-story tower. The typical office floor was four by seven bays in plan, each bay being 27 ft. square and divided into four ft. six in. modules. Elevators, stairs and other service elements were concentrated in a core at the center of the building. The tower was enclosed in a curtain wall with vertical mullions in natural aluminum spaced four ft. six in. apart. The occupied floors had spandrel panels of green and white veined marble and windows of green-tinted glass; the mechanical floor at the roof was defined by aluminum louvers. At the ground floor, a wall of clear glass set back from the aluminum-clad columns enclosed the entrance lobby. A paved plaza with a group of trees was partly enclosed and defined by the tower and a low commercial building. This three-story structure for shops had large clear glass windows at ground level and a curtain wall above in the same green glass and marble as the office building, but with different proportions. Behind the commercial building was a third element; a one-story structure clad in glass and marble enclosing the vehicle ramp entrances leading to the parking and receiving areas below the plaza.

C

Photographs of model showing view from southwest with parking entrance flanked by commercial structure and office tower **A**, aerial view of plaza **B**, view of plaza at street level **C**, view from northwest showing commercial structure and office tower defining the plaza **D** and site plan **E**

E



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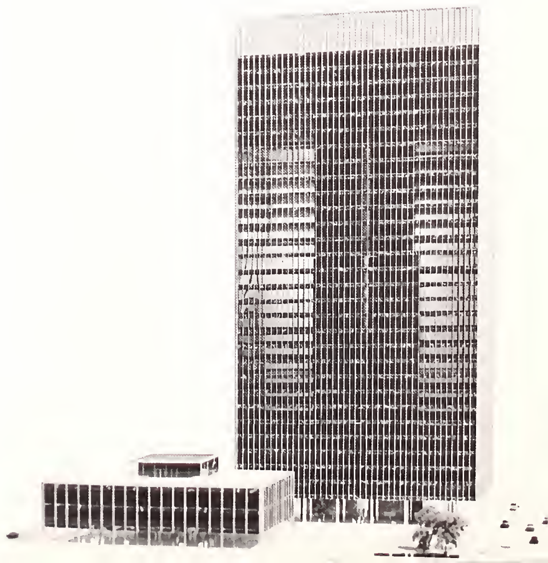
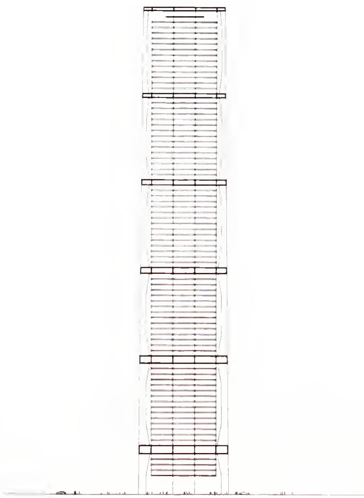


THE TALL BUILDING: THE EFFECTS OF SCALE

Myron Goldsmith, M. S. Thesis, 1953. Adviser: Ludwig Mies van der Rohe

This thesis explored the effects of scale on tall building structures and their architectural expression. First a number of examples of existing structural types were given to illustrate this principle. Then several new structural types were developed for tall buildings in both steel and concrete. One example worked out in detail was an office building with a concrete structure 80 stories high; the height was limited by contemporary elevator systems. Gravity loads were carried to the ground by a massive superstructure, in which eight columns forming three 180 ft. by 140 ft. bays supported six horizontal orthotropic plate platforms spaced fifteen stories apart. From each platform seven occupied floors were suspended below and seven were supported above, leaving the floor midway between platforms free of columns. The superstructure gave a building of this scale its necessary rigidity against lateral deflection. In visual terms, the interplay of superstructure and substructures presented new opportunities for architectural expression. Also, three new possibilities were presented for tall steel buildings, each 60 stories high. Their floors were clear spans with no interior columns; all loads were carried on the perimeter walls which were stiffened against lateral movement by three different systems of diagonal bracing.



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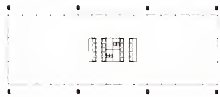

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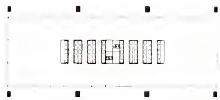

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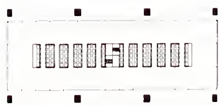

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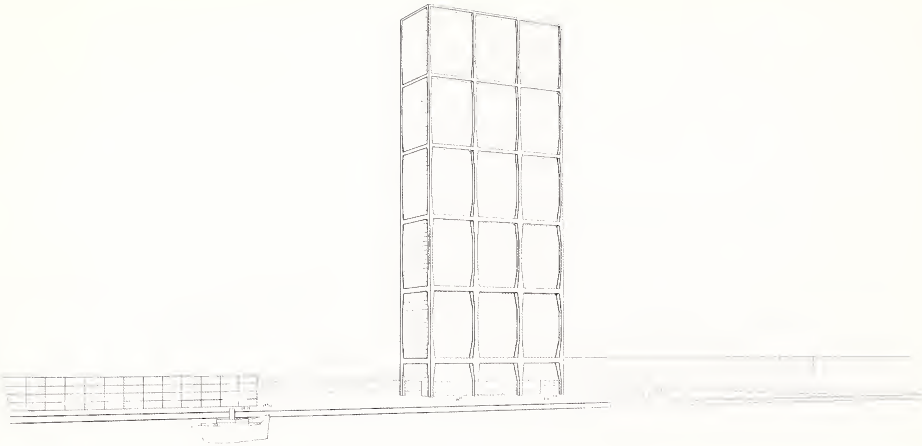
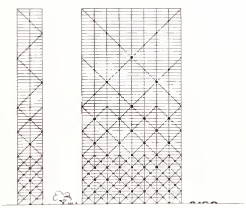


A

An 80-story office building in concrete. View of the tower on a waterfront site **A**, transverse section showing superstructure columns and platforms with suspended and supported substructures for occupied floors **B**, plans of typical lower floor **C**, typical intermediate floor **D** and typical upper floor **E**. Three sketch proposals for 60-story office buildings in steel with no interior columns and varying configurations of diagonal bracing for lateral stability. End and side elevations **F**, **G**, **H**



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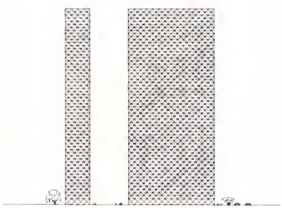

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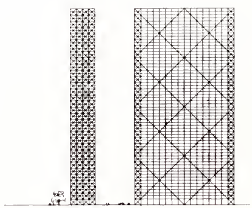
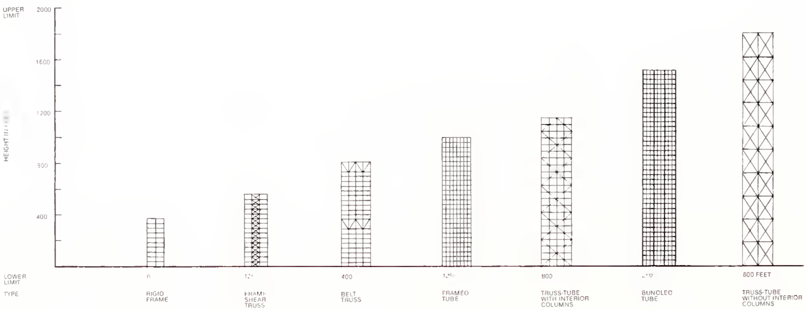


H

One illustration of the effect of scale in long-span structures was the diagram, shown on the opposite page, which was developed by Myron Goldsmith for his thesis of 1953. It shows a comparison of the span ranges of six types of bridge structures, starting with the plate girder with a 600 ft. maximum span and continuing through the catenary suspension system with a longest span of 4200 ft. In the theses done under Goldsmith's direction, he sought to explore the implications of the effect of scale, particularly in the upper ranges of building height and span, seeking structures with the greatest economy of means for their size, and developing and clarifying their architectural expression.

Fazlur Khan collaborated in this search, making many significant contributions. One of the most important of these was the concept of the tall building with no structural premium for height due to the effect of wind or other lateral loads. In his work with Goldsmith on the thesis projects and in practice, he developed a series of high-rise structural types of increasing height which were designed for gravity load alone, and yet had proper lateral stability. These types began with the conventional rigid frame and shear truss braced frame, and continued upwards through the belt truss, framed tube, truss-tube with interior columns, bundled tube and truss-tube without interior columns. In addition he further developed the criteria for the lateral stability of tall buildings, extending them beyond simple considerations of overturning and static deflection to the dynamic effects of harmonic periods and human perception of acceleration.



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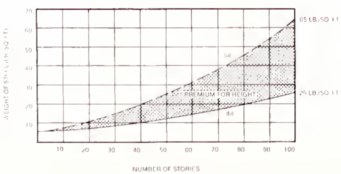

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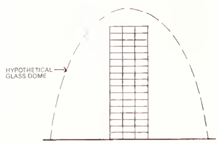

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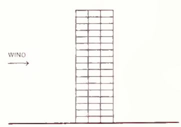

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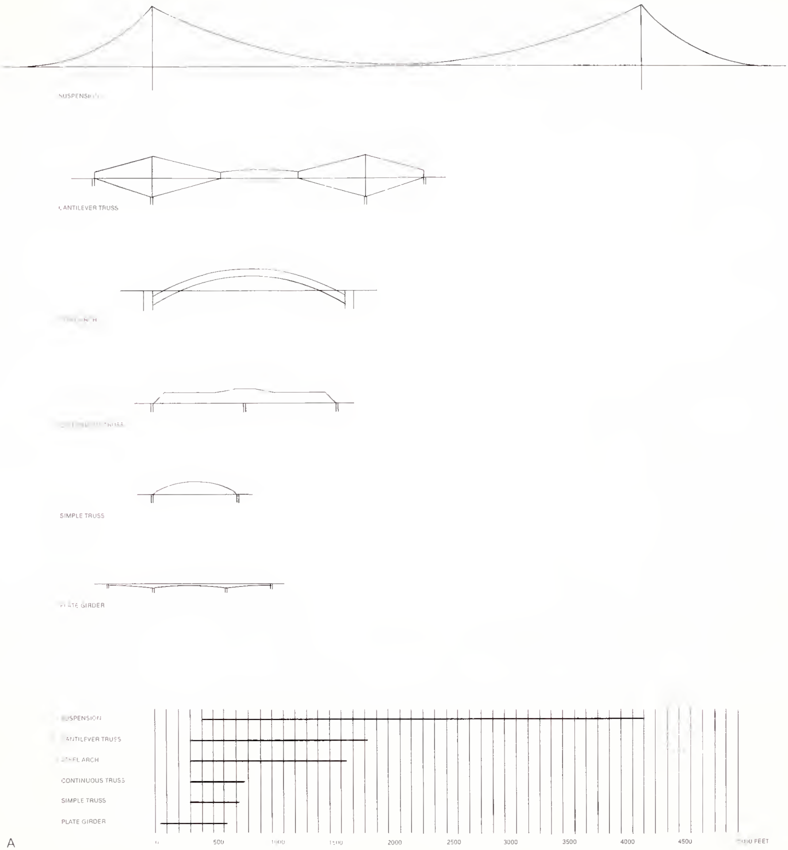


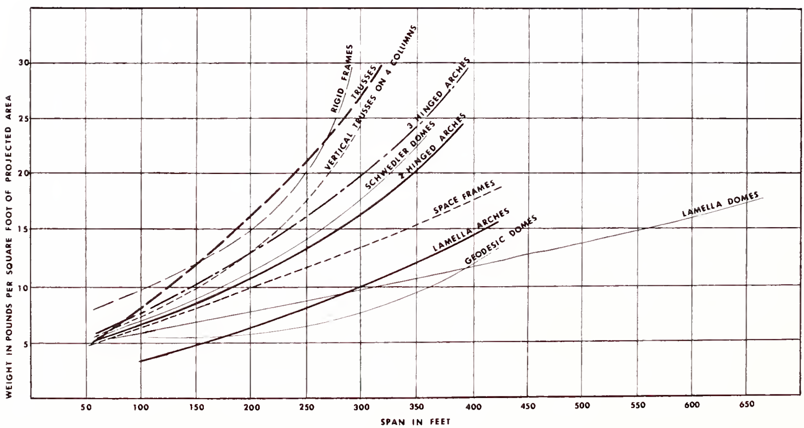
A

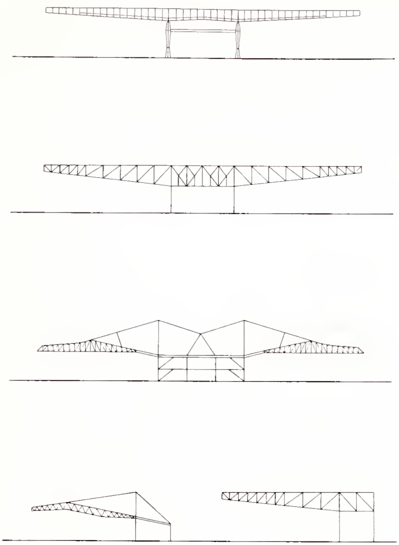
The effects of scale in bridge structures; schematic diagram showing the span ranges of six different steel bridge types c.1953 **A** The effects of scale in high-rise structures; graph **B** showing the unit weight of steel versus height in stories for a normal rigid frame system for (b) the effect of gravity load alone and (a) the effect of gravity and wind loads combined, schematic diagram **C** showing the maximum heights of different high-rise structural systems which closely approximate the lower curve (b) with no premium for height shown in the graph B.

A STUDY OF LONG-SPAN STEEL ROOF STRUCTURES

David C. Sharpe, M. S. Thesis, 1963. Adviser: Myron Goldsmith, Co-Adviser: Fazlur Khan

This analysis of 166 long-span structures in steel classified them according to structural type, span and weight of steel per sq. ft. Altogether eleven different structural types were investigated: rigid frames, trusses, cantilevers, vertical trusses on four columns, three-hinged arches, schwedler domes, two-hinged arches, space frames, lamella arches, geodesic domes and lamella domes. On the opposite page are shown the individual graphs of span versus lb. per sq. ft. of steel for two of these types, cantilevers and rigid frames, together with drawings of some of the examples of each type. Below on this page is shown a composite graph giving the characteristic curve of each structural type. The composite graph shows that for the lower range the curves tend to coincide and that it does not matter very much which structural type is used. However, in higher span ranges, the curves diverged radically, with only the lamella dome extending beyond 450 ft. Recent structures tended to be lighter due to the use of welding, tubular compression members and high-strength steel.





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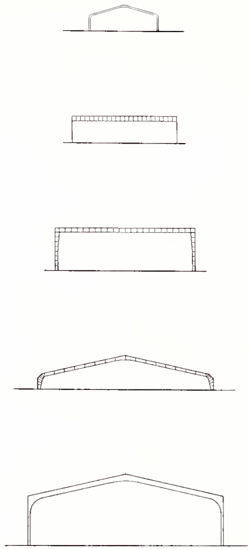
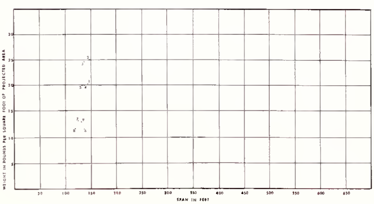


E

Composite graph showing steel quantity versus span for different types of structures **A**. Graph showing steel quantity versus span for cantilever structures **B**, drawings of some of the cantilever structures used in the graph data **C**. Graph showing steel quantity versus span for rigid frame structures **D**, drawings of some of the rigid frame structures used in the graph data **E**.

B



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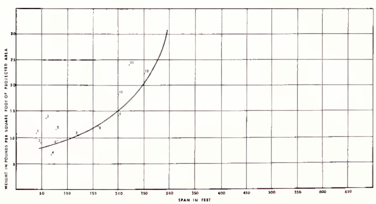
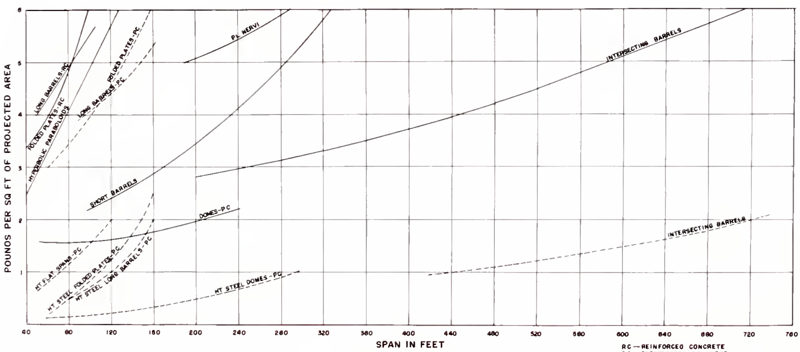


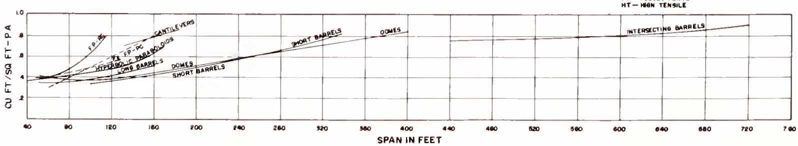
A STUDY OF LONG-SPAN ROOF STRUCTURES IN CONCRETE

Phyllis B. Lambert, M. S. Thesis, 1963. Adviser: Myron Goldsmith, Co-Adviser: Fazlur Khan

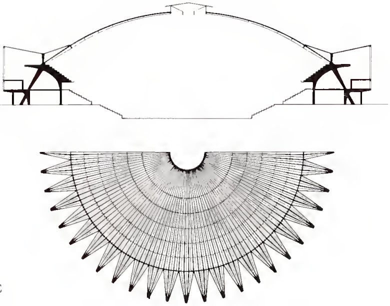
This study paralleled the previous thesis' work in steel roof structures, analyzing 175 reinforced concrete roof structures according to structural type, span, steel and concrete quantity per sq. ft. of projected area, and cost per sq. ft. in constant dollars. Nine different structural types were studied, including flat spans, folded plates, long barrels, short barrels, hyperbolic paraboloids, domes, intersecting barrels, suspension systems and cantilevers. On the opposite page are shown the individual graphs of the parameters for domes, with drawings of two examples used in the data. Below on this page, as with steel, are two composite graphs showing the characteristic curves for each structural type studied. The composite graphs showed that the types divided into two distinct categories, with a break at a span range of about 100-120 ft. The intersecting barrel predominated beyond 250 ft.



STEEL QUANTITY



CONCRETE QUANTITY



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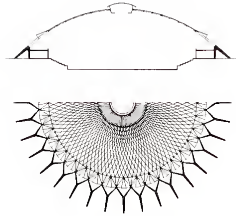
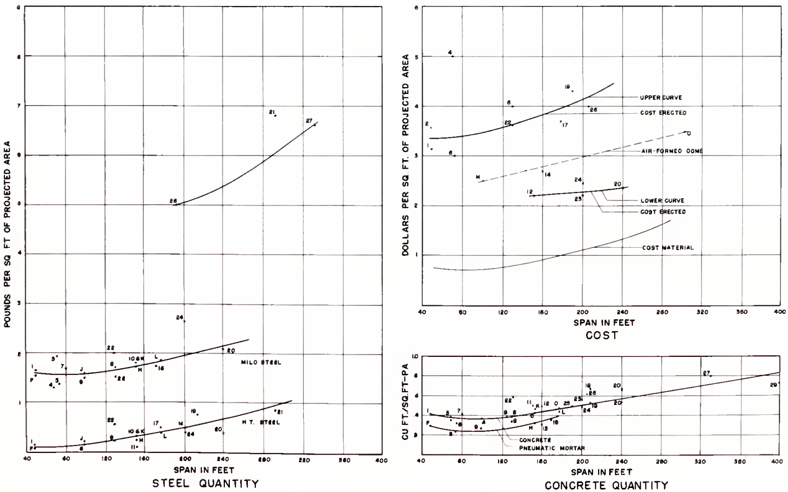


D

Composite graphs showing reinforcing steel quantities versus span and concrete quantities versus span for different types of structures **A**. Graphs showing steel quantity, concrete quantity and cost, all versus span for concrete domes **B**. Half-plans and sections of two domes used in the graph data; Palazzo del Sport **C** and Palazzetto del Sport **D**, both by Pier Luigi Nervi.

B



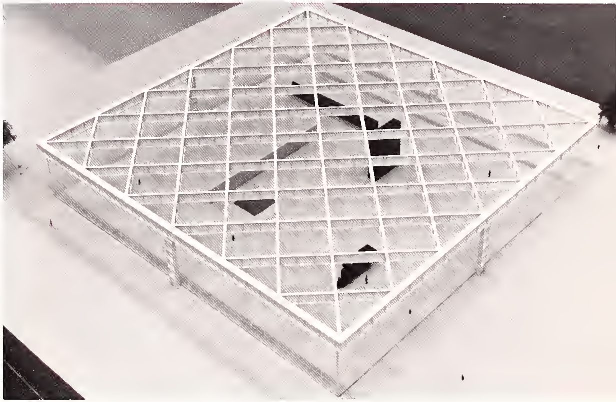
A TRAIN EXHIBITION HALL

Meiji Watanabe, M. S. Thesis, 1962. Adviser: Myron Goldsmith

The possibilities of a cantilevered diagrid structure were explored in this project for an exhibition hall to house the locomotive and railroad collection of the Chicago Museum of Science and Industry. A diagonal grid of steel plate girders eight ft. deep and spaced 35 ft. apart spanned the 300 ft. square roof, connected at the perimeter to a steel box-girder. The perimeter girders were supported at their midpoints by hinged connections placed atop built-up steel H-columns, with seven ft. web plates and three ft. wide flanges. The webs of the girders and columns were reinforced against buckling with stiffeners, which also gave them a common visual cadence. The structure was enclosed with walls of clear glass, set just inside the columns. A minimum of elements were placed within the 45 ft. high clear-span hall: an access stairway leading to services facilities on the lower level, and a duct shaft to bring air to and from ventilation equipment located below grade. All the other elements were to be movable to accommodate changes in exhibitions.

B

Photographs of models showing view of building entrance with adjoining column **A**, view of full facade **B**, view of model with roof removed showing diagonal grid structure **C**, and view of site model showing relation of new structure to existing museum **D**



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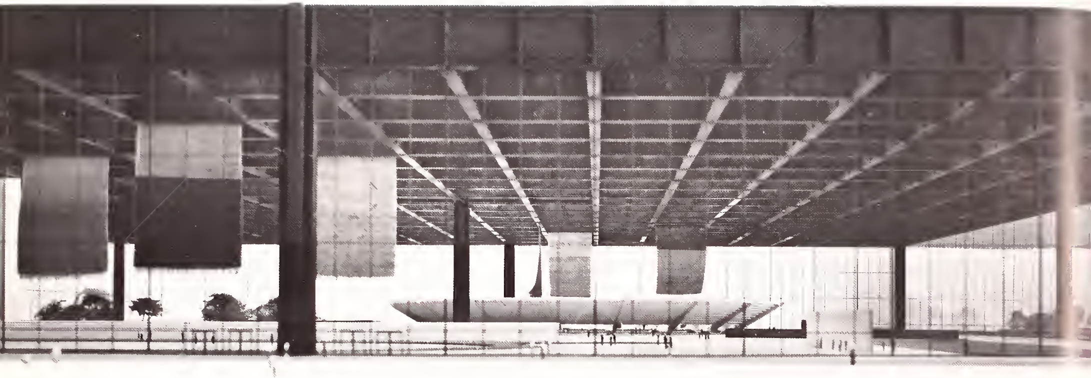
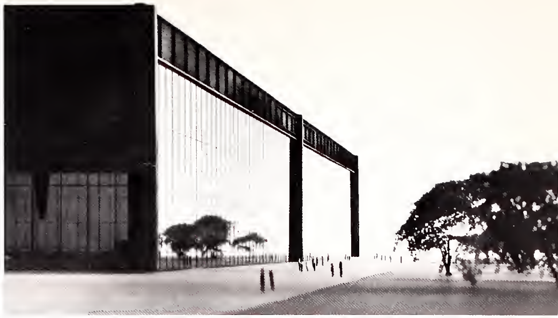


A SPORTS CENTER

Emmanuel Glyniadakis, M. S. Thesis, 1964. Adviser: Myron Goldsmith, Co-Adviser: Fazlur Khan

A wide range of public sports facilities were combined in this project, housed in a single building. They included an arena seating up to 13,000 spectators for hockey, basketball or boxing; a running track and field event area with seating for 1,000; a swimming pool with 2,000 seats, and a large flexible area for other sports. On a lower level were placed dressing rooms, service facilities, mechanical equipment, and parking for 1,500 cars. The building was 810 ft. square, with a two-way grid roof structure supported on nine columns, forming four 405 ft. square bays. The roof grid was made up of seventeen ft. deep steel plate girders spaced 45 ft. apart with their webs reinforced by vertical stiffeners; horizontal stiffeners resisted the heavy shear near the central columns. A secondary grid of rolled steel beams spanning the cells between the girders supported the glass roof; the walls were also of glass. Steel cruciform columns nine ft. wide carried the roof grid 87 ft. above the floor.

Photographs of model showing view through window wall facing arena **A**, oblique view of building facade **B**, view of interior elements with structure removed **C**, and overall view showing roof grid structure from above **D**



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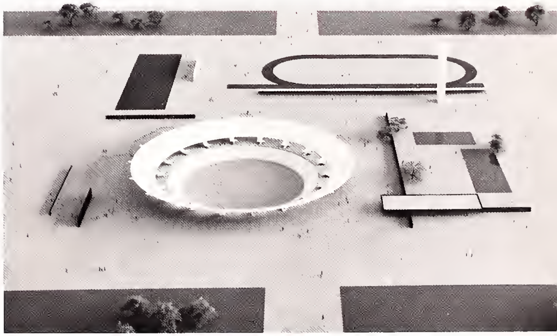

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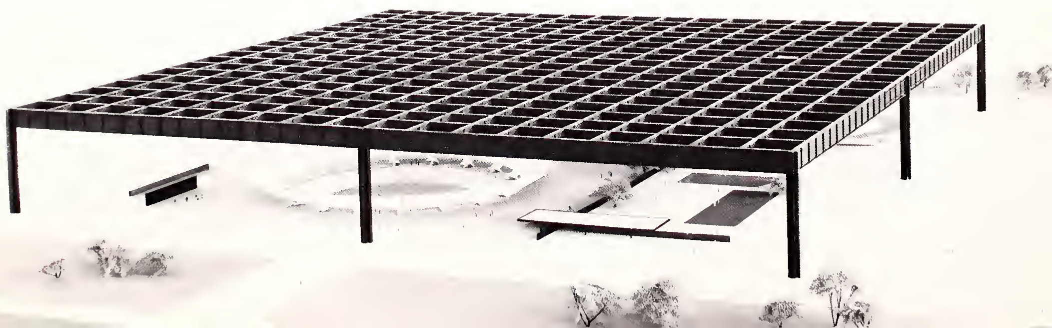
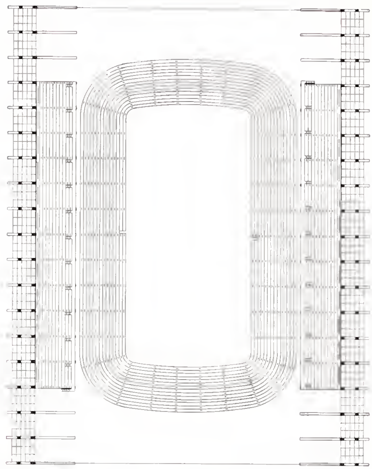


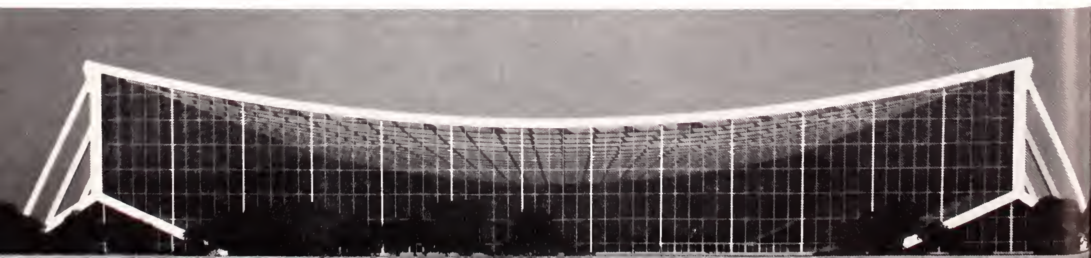


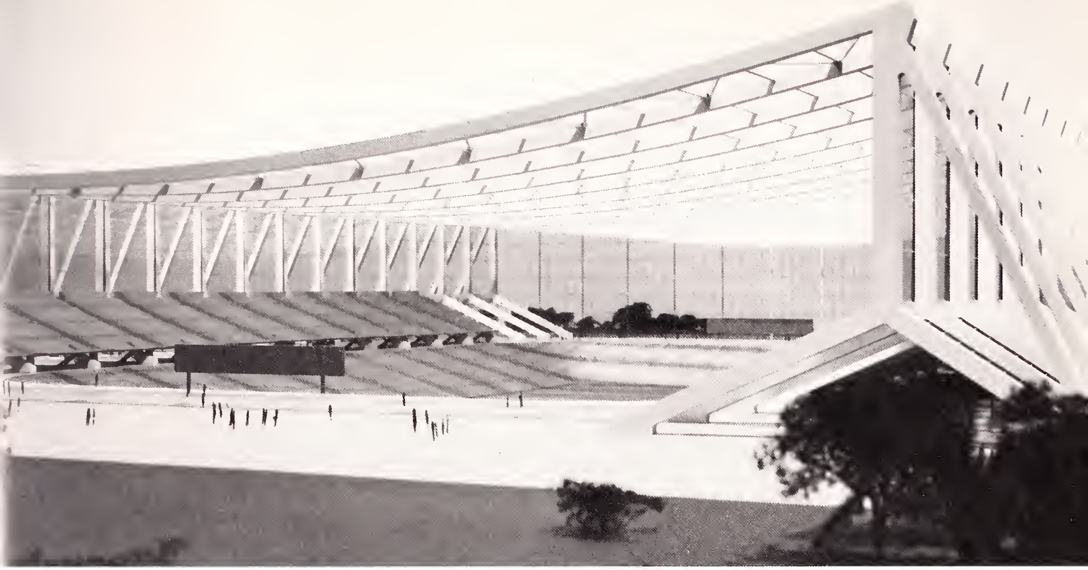
A

B

Plan **A**, photographs of model showing view through structure with concrete bents and concrete-encased catenary cables **B**, end elevation **C**, and view into interior with end wall removed **D**.

C

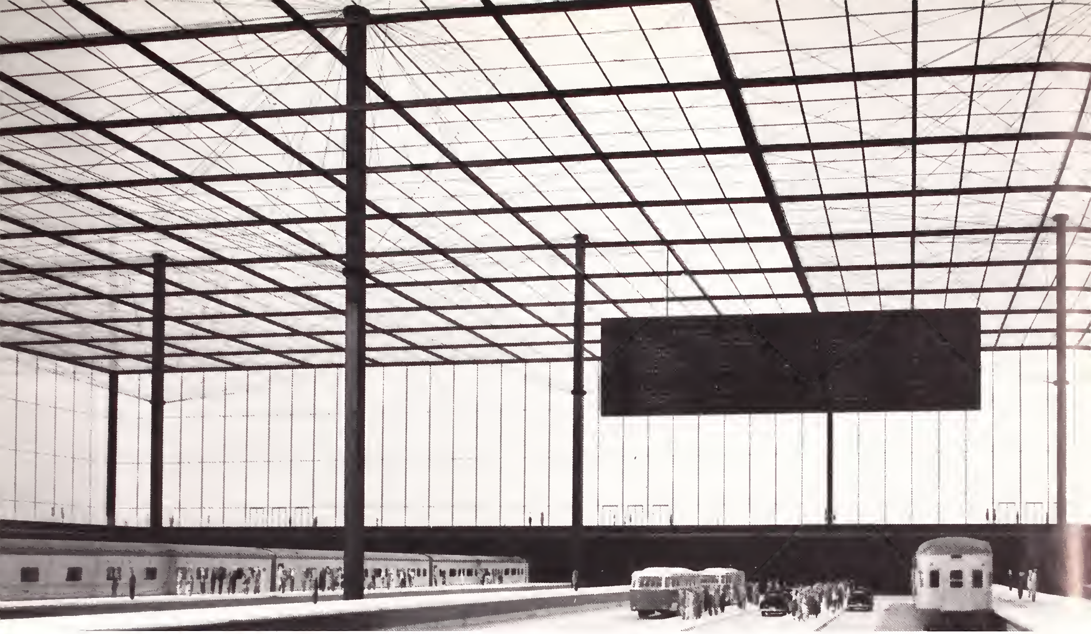




A SPORTS ARENA

Peter J. Doyle, M. S. Thesis, 1965. Adviser: Myron Goldsmith, Co-Adviser: Fazlur Khan

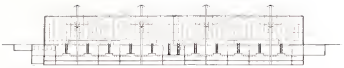
This enclosed stadium provided seating for 65,000 spectators for football and other sports events. The roof spanned an area 650 ft. wide by 900 ft. long with bundled catenary steel suspension cables, spaced 50 ft. apart. The cables were grouted within precast concrete cladding, and then post-tensioned to give the roof added vertical stiffness. Precast prestressed concrete beams were set 27 ft. apart between the catenary beams, and the spaces between them filled with glass. The space between the last two catenary beams at each end also had diagonal brace beams to give lateral stability to the roof. The catenary beams were supported by inverted Y-shaped bents 125 ft. high, which also supported the upper tier of seats; a glazed pedestrian concourse was created between the legs of each row of bents. The remaining seating was recessed into the ground in the form of a rectangular bowl with rounded corners. The walls of the arena were enclosed in glass. A diagonal tension member connected the top of each bent with the ground to absorb the inward thrust of the catenary beams.



A RAILWAY STATION FOR CHICAGO

Lawrence Kenny, M. S. Thesis, 1968. Adviser: Myron Goldsmith, Co-Adviser: Fazlur Khan

This thesis project proposed combining all the passenger train traffic for Chicago in a single glass-enclosed hall, 600 ft. wide, 900 ft. long and 65 ft. high. Passengers would enter the station on all sides at street level; the trains would be reached from a wide waiting concourse spanning the middle of the station from which escalators led down to the boarding platforms and tracks, lighted by large open wells cut in the floor. The cable-stayed roof structure was supported on tubular steel masts, spaced 150 ft. apart, and rising 25 ft. above the roof. From the top of each mast, 36 cables radiated downward to support the intersections of a two-way grid of steel beams spaced 30 ft. apart. The 30 ft. square cells of the grid were infilled by a secondary grid, supporting ten ft. square plexiglas domes. From a second node on each mast 25 ft. below roof level, twenty additional cables radiated upward to the edge intersections of the 150 ft. grid to restrain it against lateral motion. The walls of the structure were of tinted glass.



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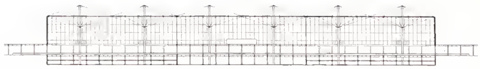

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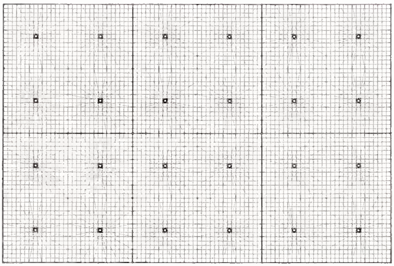

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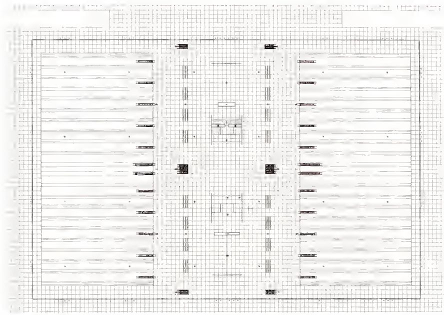


D

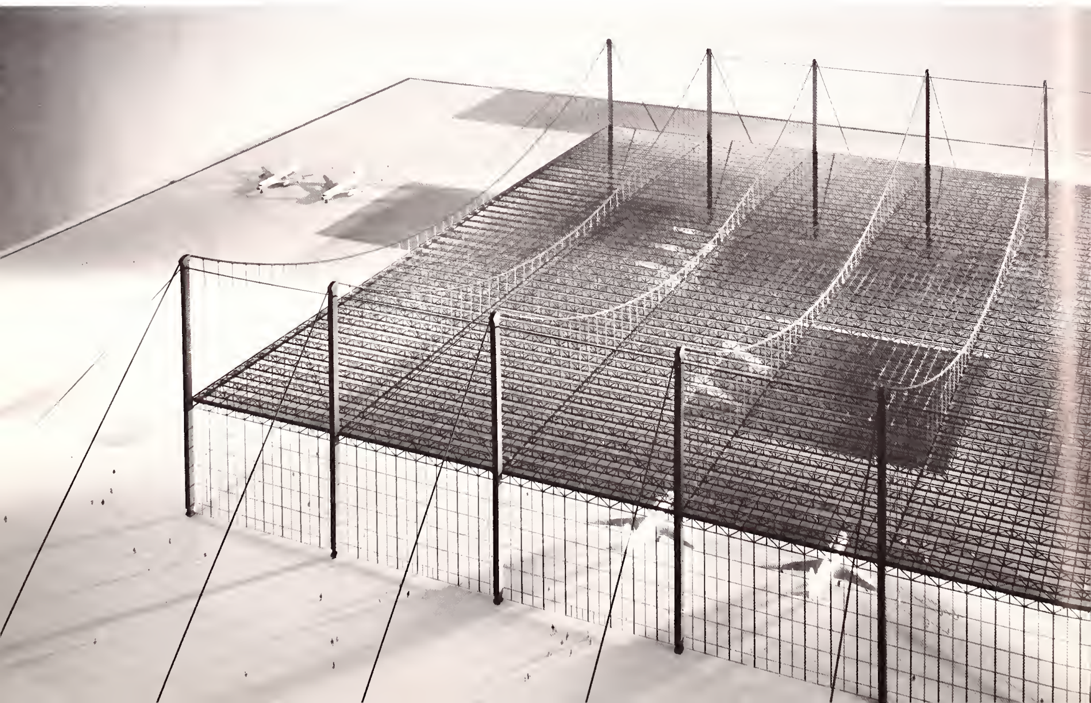
Photographs of model showing interior with train boarding platforms at track level and cable-stayed roof structure above **A**, and overall exterior view **B**. Roof plan **C**, street level plan **D**, transverse section **E**, and longitudinal section **F**.

B

AN EXHIBITION HALL WITH A SUSPENDED ROOF STRUCTURE

Peter Pran, M. S. Thesis, 1969. Adviser: Myron Goldsmith, Co-Adviser: Fazlur Khan

The roof of this large exhibition hall, with a clear span of 1,000 ft., was supported by a system of catenary cables similar to those used in suspension bridges.The thirteen main cables were spaced 167 ft. apart along the 2000 ft. length of the building. Each cable was slung between two cast steel saddles placed atop steel columns 240 ft. high; the cables are extended diagonally downwards from the columns and anchored below grade. A single stay cable connected the tops of each row of columns, restraining them against lateral motion. The roof itself was made of steel trusses eight ft. deep, hung from the main cables by suspender cables spaced 20 ft. apart. The interior of the hall is 100 ft. high, and lighted by a glazed roof and full-height glass walls. The roof structure was cambered upward, and would rise and fall about one ft. due to the thermal expansion and contraction of the cables; there was a sliding joint at the top of the glass walls to allow for this movement. A more general investigation was made of the possibilities of this roof system. It was found that in terms of material, this system was the most economical of all types, including domes, for roof spans in steel beyond 700 ft.



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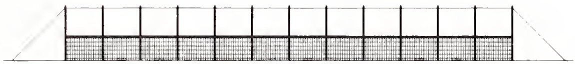

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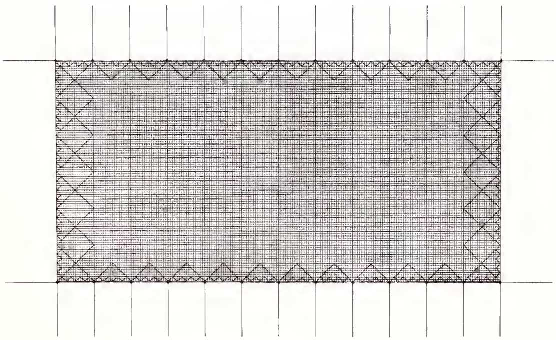


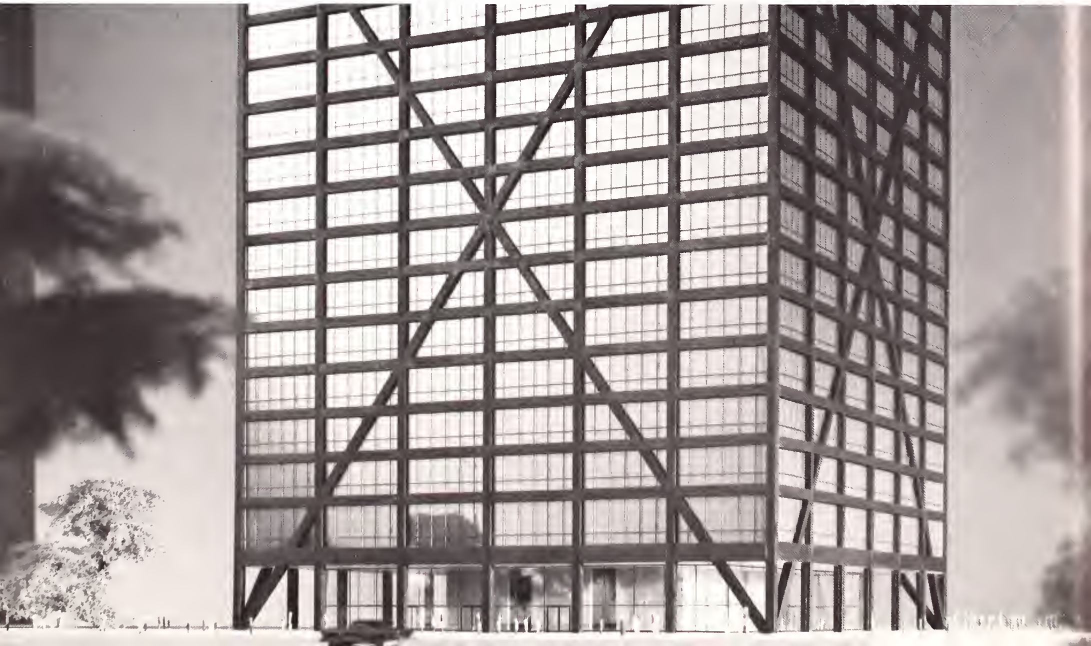
E

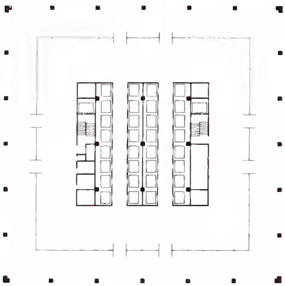
Photographs of model showing view from above of catenary cables supporting roof strucfure **A**, and view through structure at ground level **B**. End elevation **C**, side elevation **D**, and roof plan **E**.

A TALL OFFICE BUILDING

Mikio Sasaki, M. S. Thesis, 1962. Adviser: Myron Goldsmith, Co-Adviser: Fazlur Khan

This project investigated a structural system for a 700 ft. high office tower subjected to the severe wind and seismic forces found in Tokyo, Japan. A steel structure was developed for a building with a square plan 168 ft. by 168 ft., with columns spaced 28 ft. apart around the perimeter. The floors spanned 56 ft. to a group of columns located within the service core. To resist lateral deflection, diagonal members were introduced at the perimeter wall. Each face of the tower was divided horizontally into three panels eighteen stories high, with intersecting cross braces running from corner to corner of each panel. The bracing was connected at each intersection with a beam or column, making the perimeter of the tower into a braced tube, which provided the necessary stiffness to resist wind and seismic loading. When compared to a standard moment resisting frame structure, the braced tube proved to be more economical, requiring ten lb. per sq. ft. less steel than the frame. The braced tube structure was clearly expressed on the facades; the structural members were enclosed in painted steel cladding, with windows of bronze-tinted glass set between them. Mechanical equipment was located at the top floor and at the 27th floor where there were four bays of louvers on each elevation. The entrance lobby at the ground floor had walls of clear glass recessed behind the structure.





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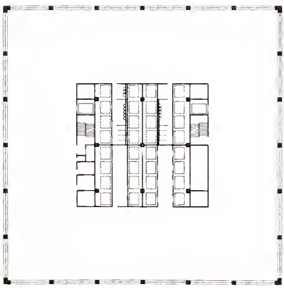

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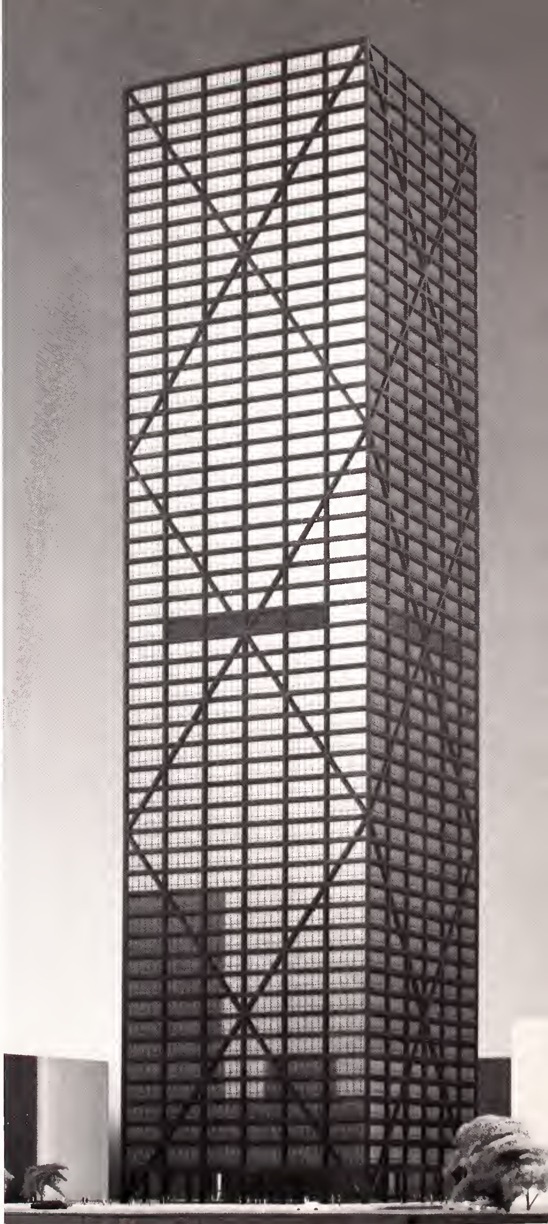
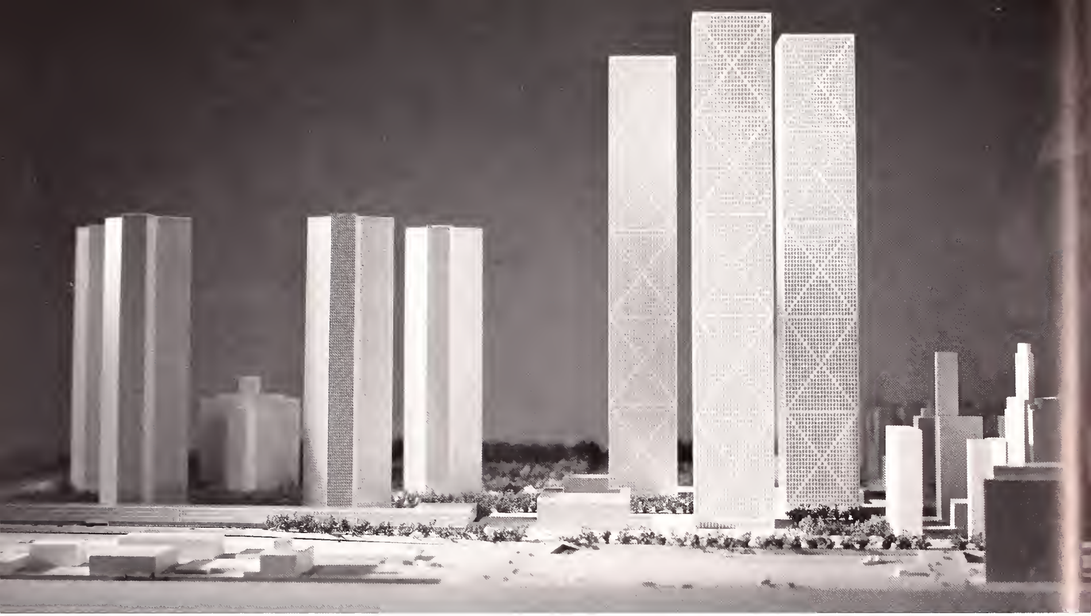


B

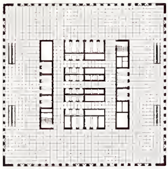
Photographs of model showing view of plaza and entrance lobby **A** and overall view **B**. Plans of typical floor **C** and ground floor **D**



AN ULTRA HIGH RISE CONCRETE OFFICE BUILDING

Robin Hodgkison, M. S. Thesis, 1968. Adviser: Myron Goldsmith, Co-Adviser: Fazlur Khan

The concrete structure of this 116-story office building combined a number of elements to form a system providing excellent resistance to lateral deflection, while being designed for gravity loads alone. The perimeter of the 220 ft. square tower was formed by a tubular array of columns spaced nine ft. four in. apart, rigidly connected to the floor structure, which spanned 45 ft. to the bearing walls of the tubular core elements. The exterior tube was braced by diagonal members, created by infilling windows between columns. Where the diagonals met the corners of the tube, they were connected by heavy horizontal tie beams. This system permitted an economical structure for a tower of this height with a width to height ratio of 1:6.5. The braced tube structure determined the architectural character of the building, with the members expressed by precast concrete cladding. The building was served by a system of large express elevators, travelling from the ground floor to four sky lobbies located at the floors below the tie beams. From the sky lobbies, banks of local elevators carried passengers to the next 22 floors above. The sky lobby floors also contained mechanical equipment. Air conditioning ductwork was distributed vertically in shafts and horizontally through standardized openings in the floor beams. Altogether the building would house 25,000 people in 5,600,000 sq. ft. A possible location for three such buildings was studied on the south bank of the Chicago River, together with a group of Y-shaped apartment towers.



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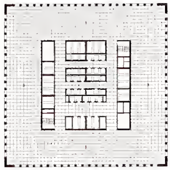

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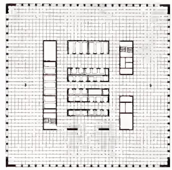

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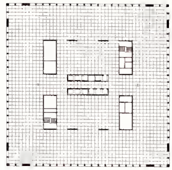
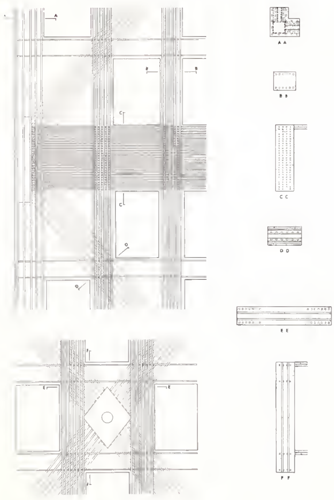


G

Photographs of model showing overall view of three similar towers with adjoining apartment buildings **A**, and view of office towers in relation to existing buildings on proposed site on the south bank of the Chicago River **B**. Structural details showing intersections of diagonal members **C** Plans of ground floor **D**, floor 26 **E**, floor 70 **F**, and floor 114 **G**



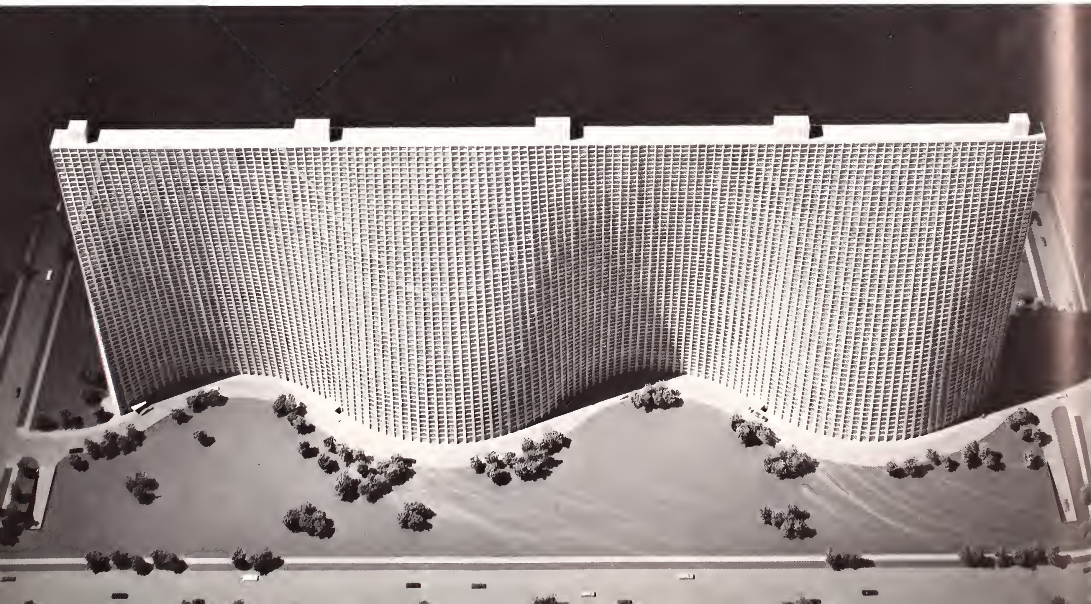
C

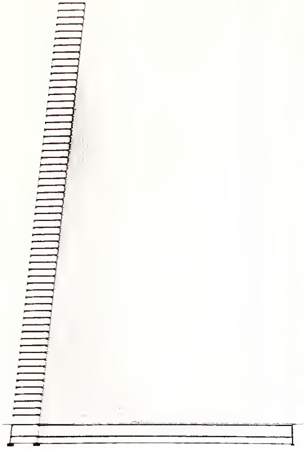
B

A FORM-STIFFENED HIGH-RISE APARTMENT BUILDING

Alfonso M. Rodriguez, M. S Thesis, 1970. Adviser: Myron Goldsmith, Co-Adviser: Fazlur Khan

The possibility of utilizing tangent conoidal forms to stiffen a building against lateral forces was explored in this project for a 60-story apartment building. In plan, duplex apartments are reached by single-loaded corridors at every second floor. The building was 34 ft. wide at every point; a straight prismatic building of this width would be limited in height to about 30 stories. By warping the building into a series of tangent conoidal surfaces, varying the plan shapes from a serpentine composed of quarter-circles at ground level to straight at the top, a greater effective depth was created at ground level to resist deflection caused by lateral loads. This permitted the height to be increased to 60 stories. The elevators and stairs were located at the tangent lines of the conoids, which form true verticals. The concrete structure consisted of columns spaced about twelve ft. apart on both facades supporting a clear span floor slab; shear walls for additional lateral stability occurred at every fourth column. This project was started in the architecture department at the Cooper Union in New York, and completed as master's thesis at IIT.



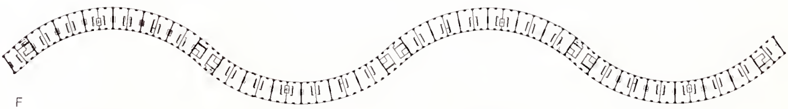


C

Photograph of model showing aerial view **A**, transverse section **B**, photograph of model showing view of undulating facade from ground level **C**, plans of floor 60 **D**, floor 59 **E**, floor 4 **F**, and floor 3 **G**

D

E



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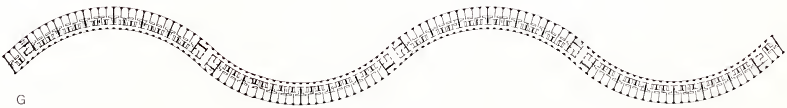

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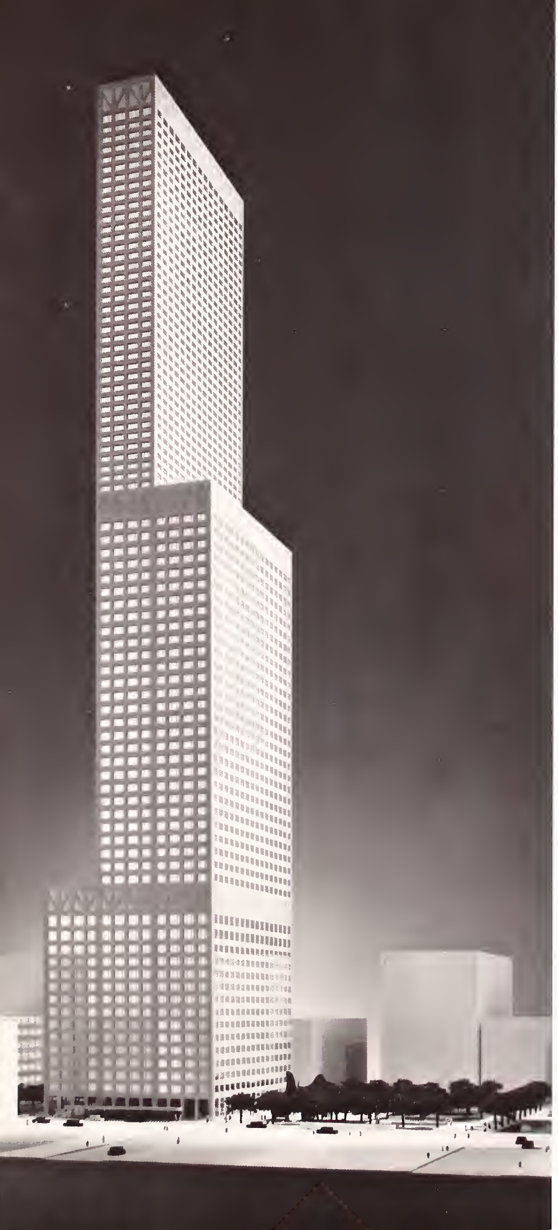

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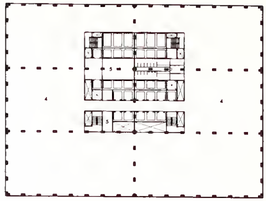

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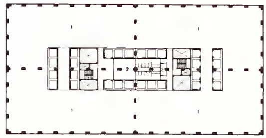

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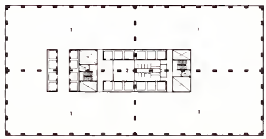

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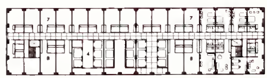


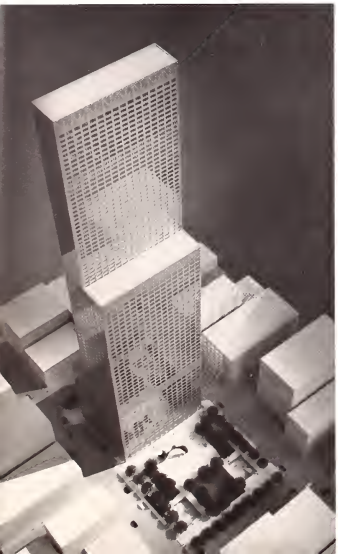
E

Photograph of model showing end elevation with belt trusses at each of the tube terminations **A**. Plans of floors 5-14 **B**, floors 19-31 **C**, floors 32-44 **D**, and floors 49-68 **E**. Photograph of model showing aerial view of building facade and plaza **F**, site plan **G**, and photograph of model in an oblique view **H**.

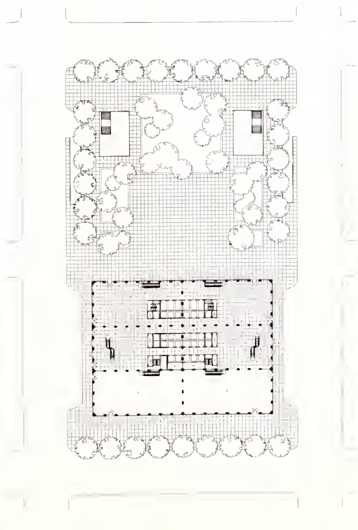
A MULTI-USE HIGH RISE BUILDING

Masami Hayashida, M. S. Thesis, 1974. Adviser: Myron Goldsmith, Co-Adviser: Fazlur Khan

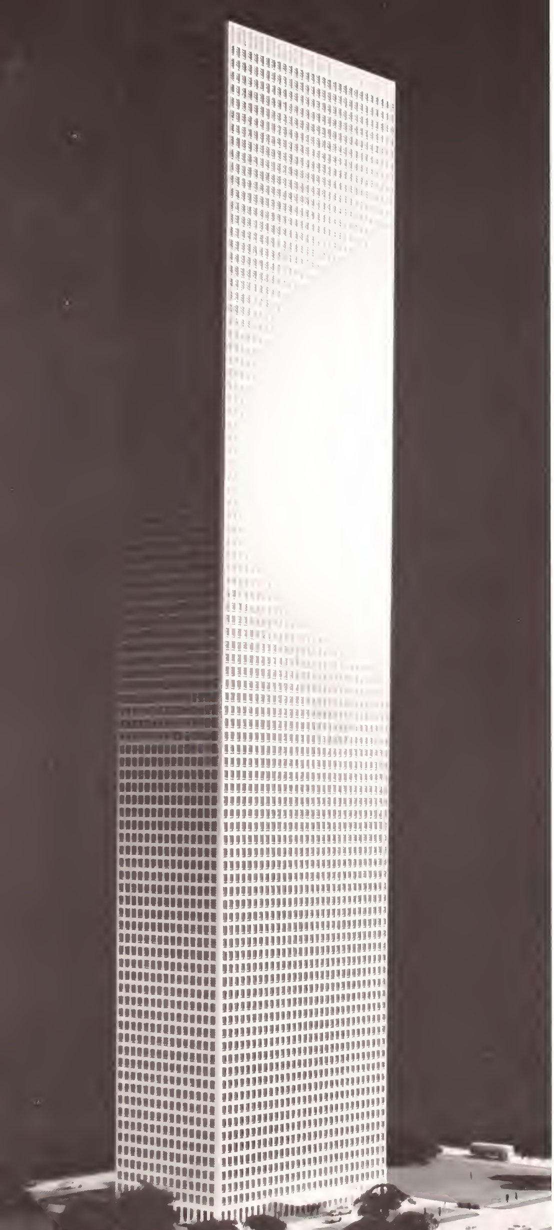
This multi-use complex combined a bank, rental office space and a 1000-room hotel in an 88-story bundled tube structure in steel. There were six rectangular framed tubes, each 60 ft. by 120 ft. in plan, with columns spaced fifteen ft. apart around their perimeters, forming an overall floor plan of 180 ft. by 240 ft. at ground level. All six tubes rose to the fifteenth floor, providing large floor areas for the bank. Above this level, two tubes were terminated. This left a four-tube floor plan of 120 ft. by 240 ft. which housed the rental office space, and was continued up to the 46th floor. Here another two tubes were ended, with the two remaining central tubes containing the hotel extending up to the 88th floor, giving the building a total height of 1058 ft. A system of express elevators brought passengers to the sky lobbies on floors 15 and 46 where local elevators served the office area and hotel respectively; the banking floors were served by local elevators from the ground floor lobby. At each termination of the tubes, a belt truss joined them together to permit effective transfer of lateral loads. The space behind the trusses was a floor housing mechanical equipment. The structure was clearly expressed on the building facades by painted steel cladding, covering the perimeter columns, spandrels and truss members. The reflective glass windows were set flush with the cladding. The tower faced an open plaza, enriched with sculpture and planting, and pierced by two courts, which led to a shopping concourse below.



G



H



A NINETY-STORY APARTMENT BUILDING

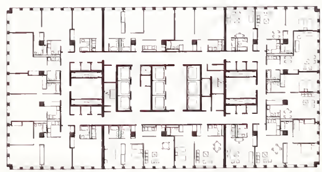
A. G. K. Menon, M. S. Thesis, 1966. Adviser: Myron Goldsmith, Co-Adviser: Fazlur Khan

This slender apartment tower rose 812 ft., supported by a framed tube structure. The upper half of the building had eight large apartments per floor, and the lower half had sixteen apartments of various sizes on each floor; each section was served by a bank of three elevators. The concrete flat slab floors were supported on the interior by columns spaced eighteen ft. apart, and at the perimeter by columns six ft. apart linked together to form a tube by the upturned spandrel beams. The exterior tube was further stiffened by two transverse shear walls running the full 90 ft. depth of the building; they in effect divided it into three bundled tubes. The shear walls and the perpendicular rows of columns acted together in a web and flange configuration to resist lateral deflection. The exterior columns diminished in size from nineteen in. by 21 in. at ground level to twelve in. by twelve in. at the roof; the spandrel beams diminished with the columns in a constant 1:1.4 ratio. Both beams and columns had an exterior cladding of marble, set flush with the windows between them.

C

A

B



Photograph of model **A**, plan of typical lower floor **B**, and plan of typical upper floor **C**.

ARCHITECTURE FACULTY AND CITY AND REGIONAL PLANNING FACULTY 1938-1978

Rank given is 1977-78 rank or terminal rank. + deceased

Architecture Faculty

Ludwig Mies van der Rohe +	Professor	1938-1958
Ludwig Hilberseimer +	Professor	1938-1967
Walter Peterhans +	Professor	1938-1960
John Rodgers	Assistant Professor	1938-1942
Stirling Harper	Assistant Professor	1936-1940
Alfred Mell +	Instructor	1936-1944
Charles Dornbusch	Associate Professor	1937-1940
William Priestley	Assistant Professor	1940-1942
George Danforth	Professor	1941-1942, 1946-1953, 1959-
Edward Duckett	Instructor	1943-1946
Elmer Forsberg +	Instructor	1943-1950
Alfred Caldwell	Professor	1945-1961
A. James Speyer	Professor	1946-1961
Earl Bluestein +	Assistant Professor	1947-1955
James Hofgesang +	Instructor	1948-1952
Daniel Brenner +	Professor	1949-1977
Jacques Brownson	Assistant Professor	1949-1959
William Dunlap +	Instructor	1949-1952
Reginald Malcolmson	Associate Professor	1949-1964
Nelli Bar	Instructor	1950-1974
Dorothy Turck	Assistant Professor	1950-1962
Paul Wieghardt +	Instructor	1950-1970
Klaus Anschuetz	Instructor	1956-1958
Howard Dearstyne +	Associate Professor	1956-1967
Paul Thomas	Associate Professor	1956-1970
Robin Walker	Instructor	1957-1958
Joseph Krofta +	Associate Professor	1958-1970
Kadanur Subbarayan	Instructor	1959-1960
Myron Goldsmith	Professor	1961-
R. Ogden Hannaford	Associate Professor	1961-
Louis Johnson	Associate Professor	1962-
David Sharpe	Associate Professor	1962-
David Bielenberg	Assistant Professor	1964-1970
Norbert Pointer	Assistant Professor	1965-1967
Erdmann Schmocker	Assistant Professor	1965-1970
Arthur Takeuchi	Associate Professor	1965-
Fazlur Khan +	Adjunct Professor	1966-1982
Jong-Soung Kimm	Associate Professor	1966-
Albert Roupp	Assistant Professor	1966-1974
Alfred Swenson	Associate Professor	1966-
San Utsunomiya	Assistant Professor	1966-
William Fejer	Instructor	1968-1973
Paul Zorr	Assistant Professor	1969-
David Hovey	Visiting Assistant Professor	1970-1971, 1978-
Alice Ulmann	Instructor	1970-
Denis Adrian	Instructor	1971-
Richard Ray	Instructor	1971-1977
John Wright	Instructor	1971-
John Heinrich	Visiting Assistant Professor	1972-
John Vinci	Instructor	1972-
Thomas Beeby	Assistant Professor	1973-
Pao-Chi Chang	Assistant Professor	1973-

Julius Ruecker +	Assistant Professor	1973-1976
Henry Hawry	Assistant Professor	1974-
Gerald Horn	Visiting Assistant Professor	1974-
Chris Karidis	Assistant Professor	1974-
Leonard Klarich	Visiting Assistant Professor	1974-1975
Yau-Chun Wong	Visiting Associate Professor	1974-1975, 1978-
Kenneth Carruthers	Assistant Professor	1975-
James Ferris	Visiting Associate Professor	1975-1977
James Ingo Freed	Professor	1975-1977
Corey Postiglione	Instructor	1975-
John Shubat	Instructor	1975-1976
Masami Takayama	Assistant Professor	1975-
Terry Young	Instructor	1975-
Jay Carow	Visiting Associate Professor	1976-
Ronald Krueck	Instructor	1976-
Kenneth Schiano	Assistant Professor	1976-1978

City and Regional Planning Faculty

Paul Thomas	Associate Professor	1970-
Peter Beltemacchi	Associate Professor	1968-
David Bielenberg	Associate Professor	1970-
Joseph Krofta +	Associate Professor	1970-1972
Erdmann Schmocker	Associate Professor	1970-
Richard Smits	Assistant Professor	1970-1974
Fred Tolson	Instructor	1973-
Taras Halibey	Assistant Professor	1974-
Madolia Mills	Assistant Professor	1974-
James Smith	Assistant Professor	1974-
Dennis Korchek	Assistant Professor	1975-
Diane Korling	Assistant Professor	1975-
Peter Land	Associate Professor	1976-

ACKNOWLEDGEMENTS

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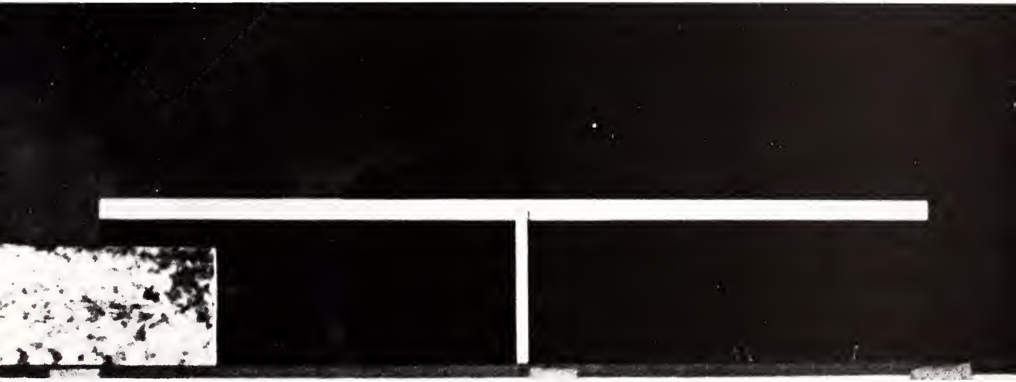

PROJECT: 50×50 HOUSE 1950 - 1951

ΣΤΑ 100 ΧΡΟΝΙΑ ΑΠΟ ΤΗ ΓΕΝΝΗΣΗ ΤΟΥ MIES

1986
Εκδηλώσεις για να τιμήσουν τα 100 χρόνια του MIES

ΕΚΘΕΣΕΙΣ

Φεβρουάριος	Μουσείο Μοντέρνας Τέχνης (MoMA) Νέα Υόρκη, Arthur Drexler
Ιούνιος	Crown Hall Σχολή Αρχιτεκτονικής I.I.T. Σικάγο, George Danforth
Αύγουστος	Μουσείο Σικάγου (Art Institute), Σικάγο, John Zukowsky
Νοέμβριος	Πινακοθήκη Βερολίνου (Berlin National Gallery), Βερολίνο

ΠΕΡΙΟΔΕΥΟΥΣΕΣ ΦΩΤΟΓΡΑΦΙΚΕΣ ΕΚΘΕΣΕΙΣ
Πανεπιστήμια Αμερικής (Αρχιτεκτονικές Σχολές), Μ. Βρετανία - Λονδίνο, Αυστραλία - Μελβούρνη, Ιαπωνία - Τόκυο, Αργεντινή - Μπουένος Άιρες κ.ά.

ΟΜΙΛΙΕΣ
Παράλληλα με τις εκθέσεις δίνονται διαλέξεις από τους Ιστορικούς της Τέχνης και Ακαδημαικούς Δασκάλους: Arthur Drexler, George Danforth, Franz Schulze, John Zukowsky, Reyner Banham, Alfred Caldwell, Fritz Neumeyer, Reginald Malcomson κ.ά.

ΑΝΑΚΑΤΑΣΚΕΥΗ του Περιπτέρου της Βαρκελώνης, Βαρκελώνη.

Το να αρχίζει κανείς δίχως ελπίδα, να επιμένει χωρίς νάχει την ανάγκη επιτυχίας, αυτό πιστεύω, πρέπει νάναι βασική μας αρχή.

Στη διάρκεια μιας μακριάς ζωής πάντα προσπάθησα να διερευνήσω το τι είναι αρχιτεκτονική.
Κι' ολοένα πιο πολύ πείστηκα ότι η αρχιτεκτονική πρέπει να εκφράζει τις βασικές απόψεις της εποχής μας και όχι τις δευτερεύουσες επιθυμίες της.

Η ουσία πρέπει να σχεδιάζεται. Αυτός είναι ο πραγματικός στόχος της αρχιτεκτονικής.
Για μένα αυτό ήταν μια μακρά διαδικασία και κάθε τι που έκανα ήταν για να φωτίζω την ουσία, βήμα προς βήμα.

Δεν μπορείς να φτιάχνεις νέα αρχιτεκτονική «κάθε Δευτέρα πρωί». Αυτό είναι σαν σκέψη απλοϊκό.

Η αρχιτεκτονική ήταν πάντα κάτι το πολύ σοβαρό.
Ονομάσαμε εποχές με το όνομά της.
Και αυτό θα γίνεται πάντα.

MIES VAN DER ROHE Ιούλιος 1969

27.3.1886 - 19.8.1969

LUDWIG MIES VAN DER ROHE

"Το έργο του - διδασκαλία και αρχιτεκτονική - επηρέασαν την εποχή μας. Μόνο μεγάλες ιδέες έχουν αυτή τη δύναμη..."

Αθήνα, Μάρτιος 1986

PROJECT: 50×50 HOUSE 1950-1951

FOR THE HUNDRED YEARS SINCE THE BIRTH OF **MIES**

To begin without the need of hope, to persist without the need of success, this, I think, should be our first principle

In my long life I have always searched for the answer to what architecture is all about.
And more and more I have become convinced that architecture should express our civilization in its fundamental aspects. Not in its secondary wishes.

The essence should be worked out. This I see is the real task of architecture. It has been a long process and everything I've ever done I did in order to clarify that step by step.

You cannot invent a new architecture every Monday morning. That is a little naive.
Architecture has always been a very serious thing. We have named whole epochs after it, and so it will remain.

MIES VAN DER ROHE July 1969

1986
Events to honor the 100 years of MIES

EXHIBITIONS

February	Museum of Modern Art (MOMA) N.Y. , Arthur Drexler
June	Crown Hall School of Architecture I.I.T. Chicago , George Danforth
August	Art Institute , Chicago , John Zukowsky.
November	Berlin National Gallery , Berlin

TRAVELLING PHOTO EXHIBITS

Universities in USA (Schools of Architecture) , Great Britain-London, Australia-Melbourne Japan-Tokyo , Argentina-Bouenos Ayres, etc.

LECTURES

To be given by Art Historians and Academicians: Arthur Drexler, George Danforth Franz Schulze, John Zukowsky, Reyner Banham, Alfred Caldwell, Fritz Neumeyr Reginald Malcomson etc.

RECONSTRUCTION of the Barchelona Pavilion , Barchelona

27.3.1886 - 19.8.1969

LUDWIG MIES VAN DER ROHE

" His work - teaching and architecture - influenced our epoch. Only great ideas have such power". "

Athens, March 1986

THE ABOVE PROGRAM WAS DEVELOPED BY MIES VAN DER ROHE AND SUBMITTED BY HIM IN 1937 TO ARMOUR INSTITUTE AT THE REQUEST OF JOHN HOLABIRD, ARCHITECT; JAMES CUNNINGHAM, CHAIRMAN OF THE BOARD OF TRUSTEES, AND HENRY HEALD, PRESIDENT OF ARMOUR INSTITUTE.

THE PROGRAM WAS APPROVED AS SUBMITTED AND IN SEPTEMBER 1938 MIËS CAME TO CHICAGO TO BE DIRECTOR OF THE DEPARTMENT OF ARCHITECTURE OF ARMOUR INSTITUTE, AND TO BE ARCHITECT OF THE PROPOSED NEW CAMPUS. ARMOUR INSTITUTE SUBSEQUENTLY BECAME PART OF THE ILLINOIS INSTITUTE OF TECHNOLOGY.

THE PROGRAM WAS DEVELOPED IN THE NEW YORK OFFICE OF RODGERS AND PRIESTLEY, WHO ASSISTED MIES WITH THE DRAWING OF HIS FIRST COMMISSION IN THE U.S.A. IN DEVELOPING THE PROGRAM ABOVE HE WAS ASSISTED BY THEM AND BY HOWARD DEARSTYNE, ALL OF WHOM HAD BEEN STUDENTS OF MIËS WHEN HE WAS DIRECTOR OF THE BAUHAUS IN GERMANY.

WALTER PETERHANS OF THE BAUHAUS FACULTY GAVE GREAT ASSISTANCE, AND DEVELOPED IN DETAIL THE PARTS OF THE PROGRAM DEALING WITH VISUAL TRAINING, GRAPHICS, AESTHETIC THEORY, AND HISTORY OF ART AND ARCHITECTURE. MIËS ALSO DREW UPON THE EXPERIENCE OF LUDWIG HILBERSEIMER, WHO CAME TO CHICAGO AND DEVELOPED THE PROGRAM IN CITY PLANNING, AND OF LILLY REICH IN ALL ASPECTS OF THE DESIGN OF INTERIORS. ALL OF THEM HAD BEEN FACULTY MEMBERS OF THE BAUHAUS AND THE TWO LATTER ASSOCIATED WITH MIËS IN PROFESSIONAL PRACTICE.

ALL OF THE ABOVE WERE, AT VARIOUS TIMES, MEMBERS OF THE FACULTY AT I.I.T. EXCEPT LILLY REICH, WHOM PERSONAL RESPONSIBILITIES PREVENTED FROM COMING TO THE U.S.A.

THE ORIGINAL DELINEATION OF THE PROGRAM WAS MADE BY WILLIAM T. PRIESTLEY UNDER THE DIRECTION OF MIËS VAN DER ROHE. THE ORIGINAL WAS LOST. THIS PRESENTATION, FOLLOWING THE ORIGINAL LAYOUT, WAS MADE BY FRANK F. AKE, JR., AN I.I.T. ARCHITECTURE STUDENT, IN 1973, UNDER MR. PRIESTLEY'S DIRECTION.

IT IS IMPORTANT TO NOTE THAT ARCHITECTURAL EDUCATION AT I.I.T. HAS BEEN ABLE TO BE VERY FLEXIBLE IN RESPONDING TO THE NEW DEVELOPMENTS WHICH HAVE OCCURED SINCE 1937 WHILE STILL FOLLOWING THE GENERAL PRINCIPLES OF MIËS' 'PROGRAM FOR ARCHITECTURAL EDUCATION' ,WHICH ARE AS VALID TODAY AS THEY WERE THEN.

ELTON JOHN

MARC BOLAN

MIET VANDER ROHE

LONDON '69.